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May 2, 2002

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

RE: WT Docket No. 02-55

Dear Mr. Caton:

Attached are the comments of the New York State Office for Technology, Statewide Wireless Network Project outlining the position of New York State with regards to FCC WT Docket No. 02-55.

The reorganization and consolidation of the 800 MHz band is an essential component for solving public safety issues that exist both within New York State and on the broader national level. Public safety and commercial operations currently share an interleaved 800 MHz channel plan that has produced interference to public safety systems in New York State, as well as elsewhere around the country. Public safety has an immediate need for additional spectrum. This is particularly true for New York State, especially along the Canadian border and in the New York City Metropolitan area.

The New York State Office for Technology, on behalf of the State of New York, is in the process of procuring a new Statewide Wireless Network (SWN) for State, Federal and local governmental entities that operate within or in the proximity of New York State's borders. It will be used in day-to-day operations, as well as for disaster and emergency situations to more effectively and efficiently coordinate the deployment of all levels of government resources to such incidents. It will also enhance international coordination along the US/Canadian border, and will play a critical role in supporting the homeland defense efforts within and immediately surrounding the State of New York.

The key to successful implementation of New York's new public safety communications network is the availability of usable spectrum. New York urges the Commission to use this proceeding as a vehicle to provide near-term spectral relief to public safety; relief that is desperately needed to protect our citizens, and provide homeland defense in an age where the security and safety of our people can no longer be taken for granted.

Sincerely,

Hanford C. Thomas, Director
Statewide Wireless Network

Attachment
cc: James Dillon, CIO, NYS Office for Technology
William Pelgrin, Director, NYS Office for Technology

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Improving Public Safety Communications in the 800 MHz Band	)	
	)	
	)	WT Docket No. 02-55
Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels	)	
	)	
	)	

To: The Commission

COMMENTS OF:

Statewide Wireless Network

New York State Office for Technology

6 Executive Park Dr.

Albany, NY 12203

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Before the

FEDERAL COMMUNICATIONS COMMISSION

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	)	
To: The Commission		

COMMENTS OF

New York State Office for Technology

EXECUTIVE SUMMARY

These comments from the New York State Office for Technology Statewide Wireless Network Project represent the position of the State with regards to FCC WT Docket No. 02-55. This Notice of Proposed Rulemaking (NPRM) is an effort by the Commission to address the need to improve and enhance public safety communications in the 800 MHz band, mitigate interference, and free additional public safety spectrum. We applaud the Commission for addressing these issues, and especially for recognizing that public safety has immediate and critical spectrum needs.

The New York State Office for Technology (NYS OFT), on behalf of the State of New York, is in the process of procuring a new Statewide Wireless Network (SWN) for State, Federal and local governmental entities that operate within or in the proximity of New York State's geographic borders. SWN will provide an integrated, land mobile radio communications network that will be utilized by public safety and public service agencies in New York State, with a digital, trunked architecture that will provide both voice and data capabilities. It will be used in day-to-day operations, as well as for disaster and emergency situations to more effectively and efficiently coordinate the deployment of all levels of government resources. It will also enhance international coordination along the US/Canadian border, and will play a critical role in supporting the homeland defense efforts within and immediately surrounding the State of New York. Because it is a wireless network, the effectiveness of SWN, in terms of providing advanced functionality and promoting interoperability, lies entirely with the amount of spectral resources available with which to build the network. At the present time, the only viable spectrum that is available for construction of this network is essentially at 800 MHz. The 700 MHz public safety allocation, while a critical resource, is not available where channels are currently needed. This is due to the quantity of analog television broadcast services currently operating within this allocation, with no date certain when such operations will cease. Furthermore, as a result of the Canadian DTV Transition Allotment Plan, which is incorporated in the FCC's recently negotiated agreement with Canada, areas of the State in the vicinity of the US/Canadian border may not have 700 MHz available for more than a decade.

Reorganization and consolidation of the 800 MHz spectrum is required to mitigate against a number of issues that exist both nationally and within New York State. Public safety and commercial operations currently share an interleaved and mixed channel plan in the 800 MHz band. This has resulted in interference to public safety systems from cellular-type commercial systems in New York State, as well as elsewhere around the country. This interference exists even though often the commercial operators are operating in compliance with the Commissions rules, and within their licensed parameters. Additionally, public safety has an immediate need for additional spectrum within which it can operate. This is particularly true in New York State, and especially in the Canadian border and New York City areas.[1]

Within this response, the State of New York will:

- Address the issue of 800 MHz interference and its causes, and concur that this interference must be resolved,

[1] The Commission has failed to protect Public Safety's access to 700 MHz in the Canadian border Regions, and has left New York lacking confidence in the Commission's commitment to border issues. Furthermore, the Commission's ineffective DTV transition policies are right now affecting NYC and other major metropolitan areas, which have had critical spectrum needs for several years. In this post-September 11, 2001 era, these spectral needs demand a quick and definitive response from the Commission; it clear that this Nation's ability to provide homeland defense is directly weakened by these spectrum shortages.

- Comment on the ability of de-interlacing strategies to effectively mitigate the interference problems, including the NAM (National Association of Manufacturers) and Nextel proposals,
- Support the essence of the Nextel proposal, outside of the international border regions,
- Identify critical shortcomings within the Nextel plan in the Canadian border regions,
- Conclude that an alternative proposal must be created to effectively deal with Public Safety requirements and the international sharing agreements in these border areas,
- Illustrate that public safety has critical near- and long-term spectrum needs that remain to be addressed,
- Discuss means of handling the spectrum management, relocation, an re-coordination of the 800 MHz band,
- Consider complementary means to reduce interference,
- Note that an eventual narrowband migration of all 800 MHz Public Safety channels will free additional spectrum, and therefore request that any band reorganization reflect, at a minimum, 12.5 kHz spectral efficiency for new operations, with an eventual migration to 6.25 kHz spectral efficiency,
- In the event of a band reorganization, assert the need for new 25 kHz analog interoperability channels to replace the NPSPAC International Mutual Aid channels, and additionally provide comment on a possible set of new narrowband (digital) interoperability channels, and
- In the event of band reorganization, ask for a requirement that all new type-accepted public safety equipment within the band be able to operate on the analog

interoperability channels utilizing an analog FM common air interface, and, if digital interoperability channels are adopted, on these channels, using a digital common air interface (CAI) consistent with 700 MHz operations.

1. INTRODUCTION

Reorganization and consolidation of the 800 MHz band is required in order to mitigate against a number of issues that exist both nationally and within New York State. Public Safety and Commercial Mobile Radio Services (CMRS) currently share an interleaved and mixed channel plan in the 800 MHz bands. This has resulted in interference to public safety systems from cellular-type commercial systems in New York State, as well as elsewhere around the country. This interference exists even though often the commercial systems operate in compliance with the Commission's rules, and within their licensed parameters.

The root cause of this problem is directly related to the fact that the Commission had not adequately considered the engineering issues of mixing nationwide CMRS, particularly ESMRs (Enhanced-digital Specialized Mobile Radios) using interference-limited design methods in the same band with Public Safety, which has traditionally used noise-limited designs. Further, the Commission has not adopted rules to adequately protect Public Safety systems from the out-of-band emissions (OOBEs) of the nationwide ESMRs and other cellular operations, in which multiple adjacent-channel transmitters produce aggregated OOBEs that raise the noise levels in nearby receivers, degrading or totally masking desired public safety signals.

The Commission has also failed to protect Public Safety by its lack of commitment to ensure the availability of 700 MHz in border areas, and its inability to facilitate a rapid DTV (Digital Television) transition with a firm schedule. Its ineffective DTV transition policies right now affect NYC and other major cities, where Public Safety is starving for spectrum. It is because of these issues that the Commission must use this opportunity to free addition Public Safety Spectrum to meet these needs.

On September 11, 1996, the Public Safety Wireless Advisory Committee (PSWAC) reported Public Safety's spectrum needs through the year 2010. The PSWAC Final Report in the Executive Summary, at page 3, stated:

- *More spectrum is required.*
- *Immediately, 2.5 MHz of spectrum should be identified for interoperability from new or existing allocations. In the short term (within 5 years), approximately 25 MHz of Public Safety allocations are needed. The present shortages can be addressed by making part of the spectrum presently used for television broadcast channels 60-69 available as soon as possible.*
- *Over the next 15 years, as much as an additional 70 MHz of spectrum will be required to satisfy the mobile communication needs of the Public Safety community.*

There was a considerable investment in time and money by Public Safety entities and others in the one-year process to develop the PSWAC Final Report. The Commission has yet to do more than allocate the recommended interoperability spectrum, only a portion of the 25 MHz of immediately required spectrum — which is not usable in the spectrum-starved New York City (NYC) Metropolitan area; and, with 8 years left until 2010, the 70 MHz remains unfulfilled. Hopefully, the Commission will recognize these facts and take advantage of the current proposal to provide some additional badly needed spectrum for Public Safety that will effectively integrate into the development and expansion of Public Safety systems. However, in this NPRM, the Commission seeks yet another analysis of Public Safety spectrum needs. Considering that

PSWAC spent an entire year making a very extensive analysis of spectrum needs based upon forward-looking spectrum efficiencies that have not been achieved to date, it is not realistic to expect that yet another study can be completed in only 30 days as contemplated in this NPRM. The Commission would be well advised to re-read the PSWAC Final Report, including its Subcommittee Final Reports.

2. THE 800 MHZ BAND TODAY

The 800 MHz (806-824/851-866 MHz) band is shared by many services, among them Public Safety and CMRS, such as SMRs (Specialized Mobile Radios)/ESMRs, and Business, Industrial and Land Transportation (B, I/LT) pools. The distribution of both channels and spectral bandwidth over the services is illustrated in Figure 1.

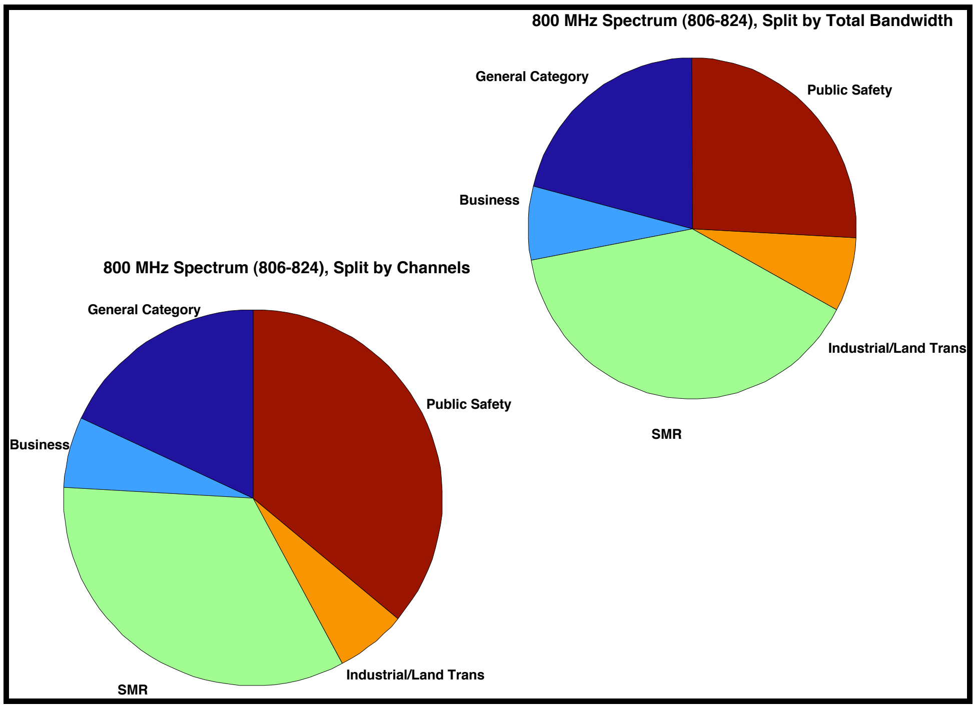

Figure 1: Sharing of the 800 MHz Band by Various Services

The current configuration of the 800 MHz band is such that the spectrum of these services is often interlaced. Therefore, public safety is often adjacent channel to other services — with the most common "neighbor" being SMR services. This is seen in Figure 2, which illustrates the spectral layout of the 800 MHz band.

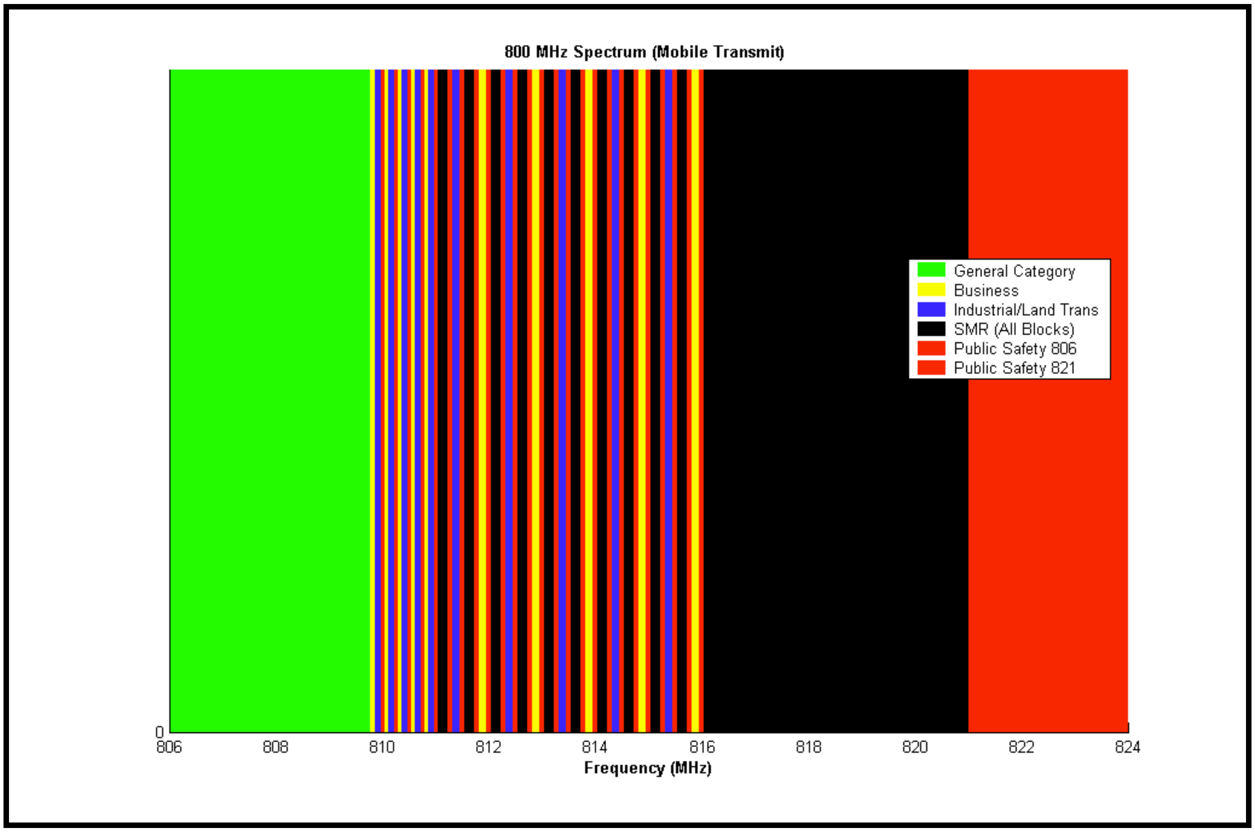

Figure 2: Current 800 MHz Band - with Interlaced Services

2.1 Current Configuration of Public Safety and Digital SMR Systems

While 800 MHz may be home to many services, the typical system designs of these services are not always consistent. Public Safety has traditionally designed its systems with maximum coverage area at minimal cost. This has led to noise-limited designs that are usually characterized by high-site elevations, tall towers, and high output powers. Since reliable 800 MHz radio coverage is generally possible only over short ranges (often < 10 miles), Public Safety sites typically require a large number of channels so that point-to-multipoint talk group operations can be supported. In effect, the communications from any single user may load all sites within the general service area, even if only a single user from his/her talk group is registered at each of the sites.

This essentially leads to a multiplicative loading effect, hence requiring a large channel set at each of the sites. Compounding this effect is that Public Safety systems need to be designed to a low call-blocking probability (Grade of Service, or GOS), so that reliable communications can be achieved, even in extreme situations.

CMRS, such as SMR, Business, Industrial/Land Transportation pools, often followed similar design philosophies, as large coverage areas tended to minimize the expenses relating to providing the mobile communications capability for a business, or as a service. Of these pools, the SMRs have traditionally utilized a large number of channels at each site to service their customer base. Industrial users tend to often require campus or indoor facility coverage; hence their operational requirements diverge from those of the other groups.

In the last 10 years, the traditional SMRs have slowly evolved into cellular-type system designs. A large number of low-elevation sites, utilizing relatively short towers and strict radiation control characterize these types of designs. These designs maximize frequency reuse by decreasing the size of the individual-site coverage area and introducing more sites that effectively reuse the available spectrum at much shorter distances. This is possible because the power levels at the mobile unit are now much higher than in noise-limited designs, due to the decreasing distance to the "closest" tower site. In effect, these cellular-type designs are interference limited — the internal system interference is much higher than the thermal noise floor. In these types of designs, the internal system interference levels act as the limiting factor that determines the coverage range of the sites within the system.

It is important to note that Public Safety has always had requirements for highly reliable coverage[2]. Additionally, this coverage is steadily expanding, due to the need to support portable radio and in-building-coverage operations. These expanded requirements also require high signal strengths everywhere within the defined serviced area. This is forcing public safety to slowly migrate toward interference-limited system designs[3] in order to provide both reliable coverage and spectral efficiency.

2.2 Causes of Interference and FCC's Characterization of Interference

When services utilizing both noise- and interference-limited system designs are interlaced onto adjacent channels, the result is likely to be interference or, equivalently, a reduction in coverage reliability. We believe that the Commission has accurately categorized the interference mechanisms in the Docket 02-55 NPRM; therefore, we defer to the findings of APCO Project 39[4] and the *Best Practices Guide*[5]. We only offer an additional illustration of the now infamous "near-far" problem resulting from this interlacing of services and designs that plagues the current 800 MHz band.

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[2] The most often utilized industry recommendations call for 97% Coverage reliability by area, evaluated in a faded environment, and accounting for both noise and interference parameters (see Telecommunications Industry Association, Technical Service Bulletin, TSB-88A WIRELESS COMMUNICATIONS SYSTEMS PERFORMANCE IN NOISE- AND INTERFERENCE-LIMITED SITUATIONS RECOMMENDED METHODS FOR TECHNOLOGY-INDEPENDENT MODELING, SIMULATION, AND VERIFICATION).

[3] Even reliable mobile coverage in irregular terrain does not allow for noise-limited designs and essentially results in a large number of sites and in high power levels throughout the service area.

[4] Project 39, Interference to Public Safety 800 MHz Radio Systems, Interim Report to the FCC, December 2001; and Six-Month Status Report, March 19, 2002.

[5] Avoiding Interference Between Public Safety Wireless Communications Systems and Commercial Wireless Systems at 800 MHz (Best Practices Guide), December 2000, by committee (CTIA, APCO, PSWN, Nextel, and Motorola).

Table 1 presents some typical parameters for a situation in which a noise-limited Public Safety system is servicing an area of 12-20 miles (reliability-dependent) with a single site. Surrounding the Public Safety site is a hexagonal grid of adjacent-channel CMRS sites, each covering ~3 miles, and together providing aggregate coverage over the same general area. The near-far problem arises when the public safety mobile unit is far from its associated site, but near one of the adjacent-channel CMRS sites. In order to simplify an explanation of the underlying interference mechanisms, no shadowing, multipath, or Doppler channel models are applied to the signals in this example.

Table 1: Parameters for Near-Far Example

Parameter	Value
Number of Public Safety LMR Sites	**1**
Number of Adjacent-Channel CMRS Sites	**98**
CMRS ACCP into LMR	**40 dB**
LMR HAAT	**400 m**
CMRS HAAT	**30 m**
LMR ERP	**54 dBm**
CMRS ERP	**54 dBm**
LMR Receiver Noise Floor	**-125 dBm**
Lognormal Shadowing Variance	**0 dB**
Delay/Doppler Multipath Model	**None**
Mean D(□I+N):	**21.7 dB**
Median D(□I+N):	**20.2 dB**
Fraction of the D(I+N) values > 12 dB	**89%**
Fraction of the D/N values > 12 dB	**95%**

ACCP - Adjacent-Channel Co-Channel Protection

HAAT – Height Above Average Terrain

ERP – Effective Radiated Power

Table 1, Figure 3, and Figure 4 illustrate the effects of the near-far problem. It is clear that the Public Safety mobile unit will experiance coverage "holes" near all CMRS sites, and that the size of these "holes" will increase with the distance from the mobile unit to its associated base. This is often refered to as the "Swiss-Cheese" effect. The reason for this is that the adjacent-channel rejection (40 dB in this case) is insufficent to maintain the necessary desired signal-to-noise-plus-interference level, $D/(\Sigma I+N)$, over the entire service area — and especially in close proximity to the CMRS sites. In this example, the net effect of mixing these systems together is to decrease the coverage of the Public Safety site by 6%. This is unacceptable[6], since a life threatening incident may occur in any of the affected areas[7]. Clearly, similar design philosophies by both parties would have resulted in minimal or no interference.

Note the near-far issue illustrated in this example also affects the reverse link (albeit somewhat differently), and contributes to many of the other problems identified by the Commission within its discussions in the NPRM. These other problems include intermodulation interference and receiver overload.

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[6] Again, this is to be compared to the typical requirement for 97% reliability by area.

[7] In fact, since the CMRS sites follow population demographics, a case can be made that incidents requiring public safety responders are more likely to occur in these areas.

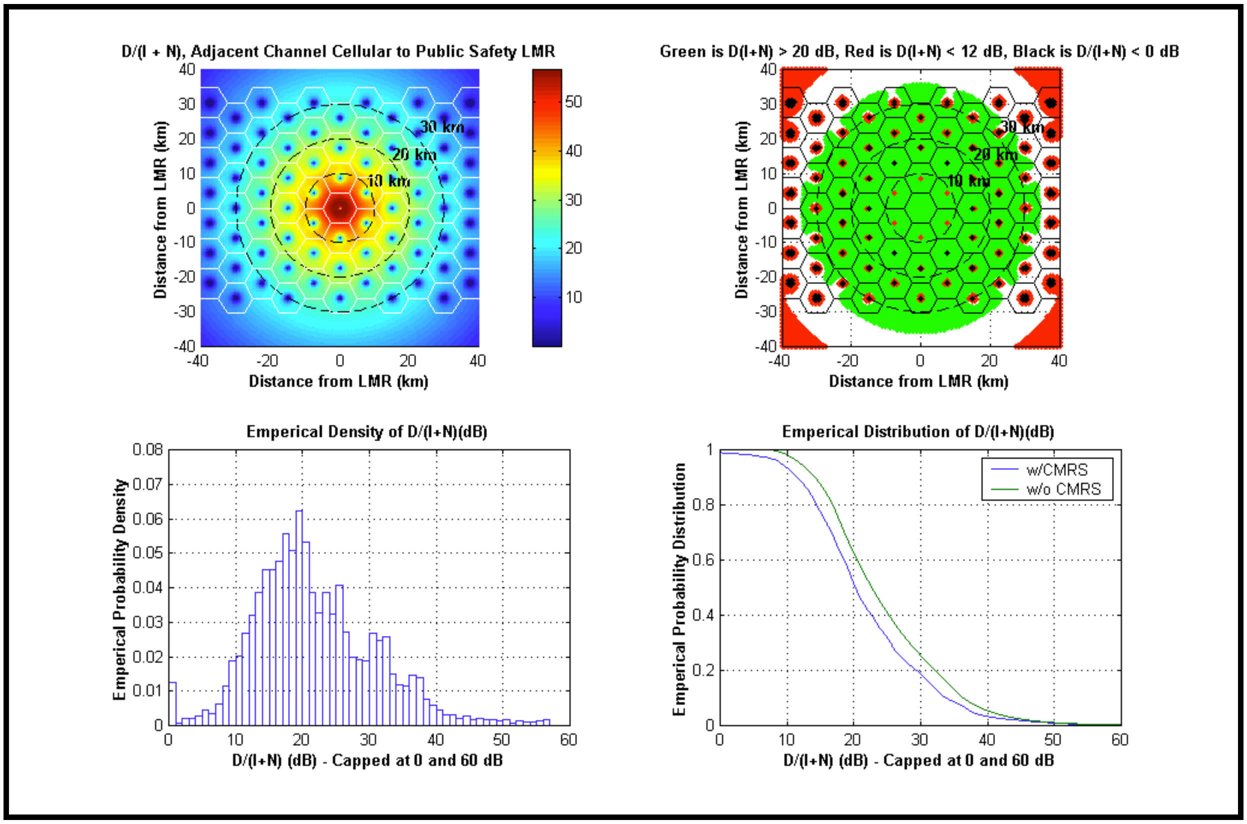

Figure 3: "Swiss-Cheese" Effect from Near-Far Problem

2.3 The Need for a Remedy

Clearly there is a need to rectify the interference problems between the different services sharing the 800 MHz band. The number of recorded cases is very large, and new incidents are being reported and documented on a daily basis. We commend the Commission for reacting to these issues, and for taking the initiative to investigate ways to solve them within this NPRM.

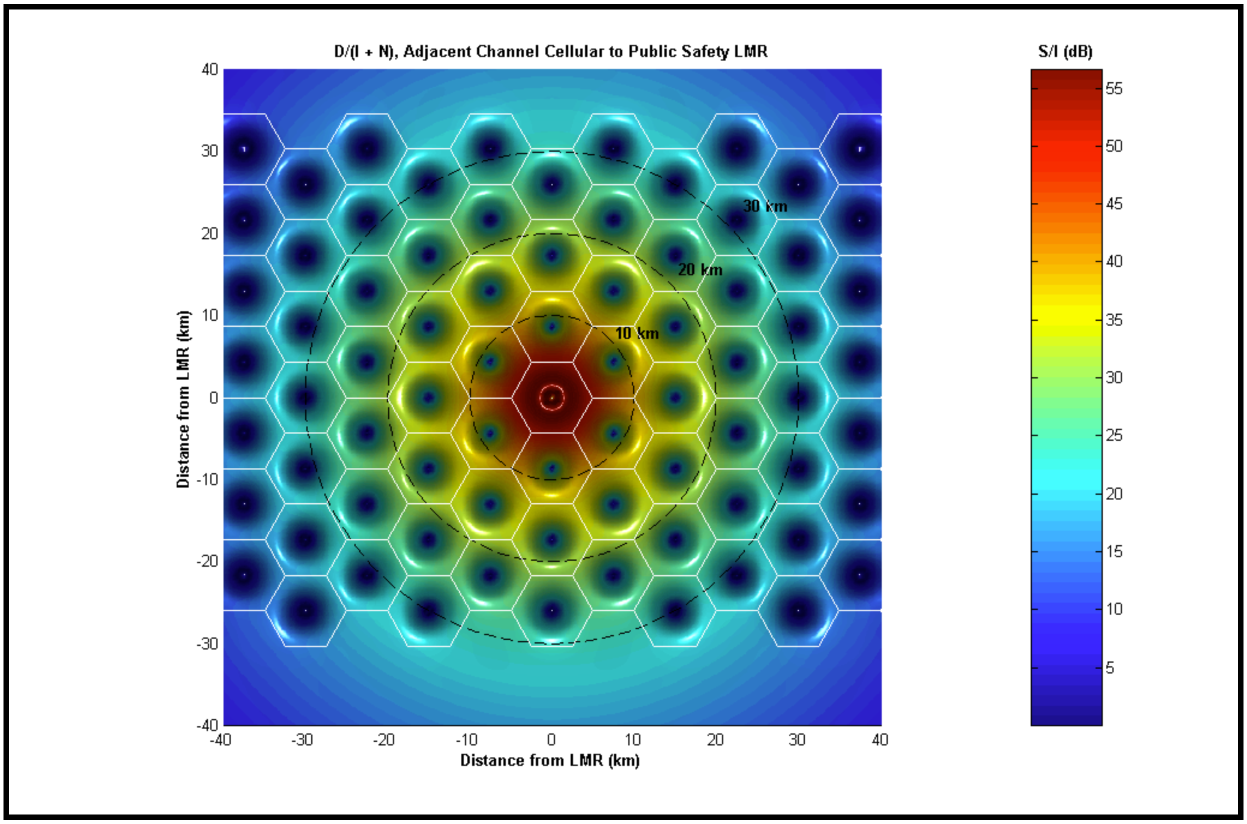

Figure 4: "Swiss-Cheese" Effect from Near-Far Problem

3. De-interlacing Strategies to Remedy 800 MHz Interference

In general, we do not think that de-interlacing strategies alone are likely to fix all of the interference issues, especially intermodulation, and will read with great interest any comments filed to the contrary. However, we do believe that placing technologies with similar operational requirements in contiguous spectral blocks is the best solution available to the Commission. As the Commission notes, the *Best Practices Guide* does indicate that public safety systems tend to be noise-limited in their design, whereas CMRS systems clearly tend toward interference-limited designs.

Care must be taken, however, because interference-limited Public Safety designs may interfere with other noise-limited Public Safety system designs whenever the service areas and infrastructures of these systems overlap each other. The current trend in Public Safety is to consolidate resources, and create shared multi-agency infrastructures. This not only will minimize the interference potential, but also will maximize operational interoperability.

3.1 The NAM (National Association of Manufacturers) Proposal

The NAM proposal outlined within the NPRM certainly has some desirable attributes. It addresses the interference problem by properly de-interlacing the spectrum. Furthermore, it minimizes the amount of relocation that needs to be performed, especially since it will not be necessary for any Pool to relocate outside 800 MHz. Because of this, it is likely that simple equipment re-tuning will be all that is necessary to accommodate the transition, resulting in lower transition costs.

However, interference is not the only issue at hand, and the NAM proposal clearly does not provide public safety with any significant amount of new spectrum. Furthermore, it is not clear whether this proposal can provide an equitable split in the Canadian and Mexican border regions. In addition the State of New York has limited short- and long-term access to 700 MHz resources, and thus needs additional 800 MHz spectrum. Because of all these factors, we cannot offer support for this proposal going forward.

3.2 The Nextel Proposal

The Nextel proposal contains the greatest merit in our estimation. While this proposal does not specifically address international border issues, it does provide significant additional public safety spectrum, outside of the international border areas. This spectrum would provide immediate relief to New York State in the Greater Metropolitan New York City areas. However, we cannot fully endorse this proposal, and instead reserve final judgment until the time we can issue reply comments, so we can examine alternative proposals in the US/Canadian border regions.

3.2.1 Desirable Attributes

The Nextel proposal has a number of extremely desirable characteristics. The proposal solves many of the interference problems, but we believe that other complementary measures are required (see Section 6). The proposal also offers Public Safety a significant amount of spectral relief, which is immediately required in the major metropolitan and border areas. Furthermore, the cost-reimbursement plan for public safety is attractive, decreasing the cost burdens imposed by relocation. The proposal yields a contiguous block of public safety spectrum that could immediately be divided into narrowband 12.5 kHz channels, and eventually to 6.25 kHz spectral efficiency, yielding additional public safety channels. The proposal also would allow the opportunity to "re-pack" and "re-pool" all NPSPAC allotments, along with an additional 10 MHz of spectrum. This would optimize the spectral reuse of the entire band, and relieve some of the burdens placed upon the 800 MHz Regional Planning Committees (RPCs) by offering them fresh pre-allotted pools with which they could quickly respond to new applicants. However, the Nextel proposal does not deal specifically with Mexican and Canadian border issues. These issues are critical, since whatever solution the FCC eventually decides upon must be applicable consistently anywhere in the nation — not just outside of the Mexican and Canadian border areas.

3.2.2 <u>The Nextel Proposal in the Canadian Border Regions - Description</u>

In the US-Canadian border Regions, a variant of the Nextel plan would need to be introduced[8]. This is because the Commission, through international-border-sharing agreements, has implemented four distinct spectrum plans in the US-Canadian border areas, and these each depend on geography and population demographics. These US-Canadian border regions are defined for the 800 MHz band as shown in Table 2 and further illustrated[9] in Figure 5.[10]

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[8] Unfortunately, the 30-day response time to this NPRM did not allow for a comprehensive analysis of the impacts of the Nextel proposal within the Mexican border areas. Since the 800 MHz sharing agreements in these areas also diverge from the band plan outside of the border areas, similar issues would be expected.

[9] For all figures and illustrations within this response, we adapted a Roman numeral convention to identify these regions.

[10] Ref. §90.619

Table 2: US-Canadian Border Region Definitions

Region	Location (longitude)	# of Current US Channels Allocated
I	66° W - 71° W (0-100 km from border)	300
II	71° W - 81° W (0-100 km from border)	180
III	81° W - 85° W (0-100 km from border)	420
IV	85° W - 121° - 30' W (0-100 km from border)	300
V	121° - 30' W - 127° W (0-140 km from border)	300
VI	127° W - 143° W (0-100 km from border)	300
VII	66° W - 121° - 30' W (100-140 km from border)	600
VIII	127° W - 143° W (100-140 km from border)	600

In essence, this variant could employ the same principles as Nextel's plan, but would achieve somewhat different results. If implemented as outlined here, no new US-Canadian sharing agreements would need to be developed, since neither the spectrum layout nor the split between the countries would change. The primary features of the modified plan would be:

- Divide the 800 MHz Spectrum into two main blocks: Public Safety and SMR/ESMRs.

- Allocate all 806-816/851-861 MHz spectrum available for US usage in any given border region to public safety. This will give public safety a total of 7.5 MHz of spectrum in Regions I, IV, V, and VI; 4.5 MHz in Region II, 11 MHz in Region III, and 14 MHz in Regions VII and VIII. This concept is consistent with Nextel's plan outside of the border Regions.

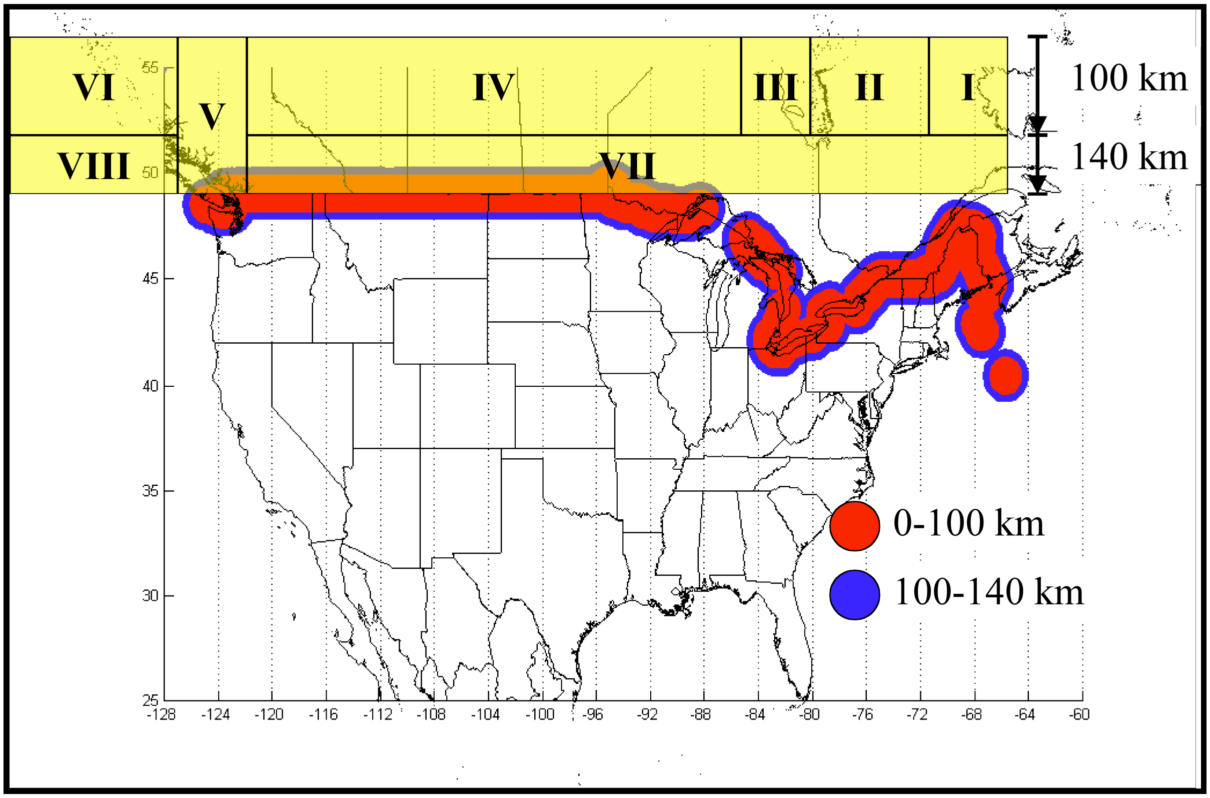

Figure 5: Canadian Impact Regions

- Allocate all 816-824/861-869 MHz spectrum available for US usage in any given border region to ESMRs. This is also consistent with Nextel's plan outside of the border Regions.

- Move all displaced Business, Industrial and Land Transportation (B, I/LT) services into either Nextel's 900 MHz or the 700 MHz spectrum, again following the current 900 MHz border-sharing agreements with Canada. This will require rule changes by the commission to allow for noise-limited high-power wide-area operations within the 700 MHz Guard Bands.[11]

[11] Noise-limited high-power wide-area operations within the guard bands may be affected by Canadian digital television interference for some time. Therefore, indoor, industrial service, and

- In certain border areas, particularly Region VII, Nextel has not offered enough 700 and 900 MHz spectrum to accommodate the B, I/LT and other displaced services. The additional spectrum to meet this need could come out of the public safety allocations within the affected regions. In Region VII, public safety has more spectrum available than the other Canadian regions. One possible approach to resolve this shortfall is that a portion of this spectrum might be offered to accommodate the new band plan, as long as the relocated services operate in narrowband mode on 12.5 kHz channel centers.[12]

3.2.3 The Nextel Proposal in the Canadian Border Regions - Analysis

The analysis for the approach described is as follows. Within the eight Regions, 800 MHz availability is summarized in Table 3, and the 900 MHz availability is summarized in Table 4. These tables describe the US spectrum in each Canadian Region, and its distribution among the services for each Region. Note that the examination of 900 MHz spectrum is necessary to determine how much of the spectrum for B, I/LT relocation needs to come from the 700 MHz guard bands. Additional material is provided in Appendices A, B, C, D, and E. This material details the band structure within each region and further provides the spectral breakdown by service and international split.

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campus-type operations, which will be robust to television interference, should be the first services migrated to the 700 MHz Guard Band spectrum. This leaves more 900 MHz spectrum available for wide-area high-power services, and optimizes the use of the available spectral resources in both bands.

[12] In the other Canadian regions, public safety not only has relatively little spectrum, but also its 700 MHz spectrum is blocked for an indefinite period of time in many areas (due to Canadian DTV allotments). Since public safety has scarce resources in these areas, every effort to utilize the 900 MHz and 700 MHz Guard bands must be made.

Table 3: Canadian Impact Regions, 800 MHz Border Agreements - US Spectrum

	Canadian Region				
	Outside	I,IV,V,VI	II	III	VII,VIII
	Channels				
SMR	280	95	60	135	190
General Cat.	150	*see(1)*	*see(1)*	*see(1)*	*see(1)*
Business	50	60	35	85	120
IL/T	50	60	35	85	120
Public Safety (806)	70	85	50	115	170
Public Safety (821)	230	116	71	195	230
US Channels	830	416	251	615	830
	% Channels				
SMR	34%	11%	7%	16%	23%
General Cat.	18%	*see(1)*	*see(1)*	*see(1)*	*see(1)*
Business	6%	7%	4%	10%	14%
IL/T	6%	7%	4%	10%	14%
Public Safety (806)	8%	10%	6%	14%	20%
Public Safety (821)	28%	14%	9%	23%	28%
US Channels	100%	50%	30%	74%	100%
	% Bandwidth				
SMR	39%	13%	8%	19%	26%
General Cat.	21%	*see(1)*	*see(1)*	*see(1)*	*see(1)*
Business	7%	8%	5%	12%	17%
IL/T	7%	8%	5%	12%	17%
Public Safety (806)	10%	12%	7%	16%	24%
Public Safety (821)	17%	9%	6%	14%	17%
US Channels	100%	50%	31%	73%	100%

(1) - General Category Combined with SMR

Table 4: US CMRS Canadian Impacts at 900 MHz by Region

	Canadian Region				
	Outside	I,IV,V,VI	II	III	VII,VIII
	Channels				
SMR	200	100	60	170	200
Business	100	50	30	90	100
IL/T	99	52	30	80	99
US Channels	399	202	120	340	399
	% Channels				
SMR	50%	25%	15%	43%	50%
Business	25%	13%	8%	23%	25%
IL/T	25%	13%	8%	20%	25%
US	100%	51%	30%	85%	100%

Upon examination of this material, we come to the conclusions reached in Table 5. In summary, this table illustrates the net movement of 800 and 900 MHz spectrum based upon the Nextel proposal as implemented in each of the Canadian border regions. As mentioned previously, while public safety yields a net increase in 800 MHz spectrum of 10 MHz outside of the border regions, inside of the border regions, the additional spectrum ranges from a gain of 150 kHz to a loss of 475 kHz. Obviously, the amount of new spectrum to be obtained is insignificant with regards to the needs of public safety, especially given that 700 MHz may be blocked in some of these areas for more than a decade (due to the current Canadian Digital Television Transition Allotment Plan and the International Letter of Understanding with the FCC).[13]

Also important is the amount of spectrum that will need to come from the 700 MHz guard band to relocate the Business and Industrial Land Transportation services. This amount ranges from 2 MHz (paired) to 7 MHz (paired). Unfortunately, Nextel only has 4 MHz of guard band spectrum, so clearly there are conflicts with relocation of these services, particularly in Canadian Regions VII and VIII. While it is possible that Public Safety may be able to offset these losses, it is important to note that Public Safety would already experience a net loss of 500 kHz (paired) in these same regions.

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[13] We elaborate on this later in this Section, as well as in Section 4.1, and in Appendices F and G.

Table 5: The Nextel Proposal in the Canadian Impact Regions - 800 and 900 MHz

Canadian Region	Outside	I,IV,V,VI	II	III	VII,VIII	Outside	I,IV,V,VI	II	III	VII,VIII
	800 MHz Channels					900 MHz Channels				
SMR/Gen Cat	430	95	60	135	190	200	100	60	170	200
Business	50	60	35	85	120	100	50	30	90	100
IL/T	50	60	35	85	120	99	52	30	80	99
Public Safety 806	70	85	50	115	170					
Public Safety 821	230	116	71	195	230					
US Channels	**830**	**416**	**251**	**615**	**830**	**399**	**202**	**120**	**340**	**399**

	Outside	I,IV,V,VI	II	III	VII,VIII
Nextel Plan Channel Deficit	-100	20	10	0	40
Additional Public Safety Channels (25.0 kHz)	100	120	70	170	240
Additional Public Safety Channels (12.5 kHz)	200	240	140	340	480

	Outside	I,IV,V,VI	II	III	VII,VIII	Outside	I,IV,V,VI	II	III	VII,VIII
	800 MHz Bandwidth (MHz)					900 MHz Bandwidth (MHz)				
SMR/Gen Cat	21.5000	4.7500	3.0000	6.7500	9.5000	5.0000	2.5000	1.5000	4.2500	5.0000
Business	2.5000	3.0000	1.7500	4.2500	6.0000	2.5000	1.2500	0.7500	2.2500	2.5000
IL/T	2.5000	3.0000	1.7500	4.2500	6.0000	2.4750	1.3000	0.7500	2.0000	2.4750
Public Safety 806	3.5000	4.2500	2.5000	5.7500	8.5000					
Public Safety 821	5.9750	3.1250	2.0000	5.1000	5.9750					
US Channels	**35.9750**	**18.1250**	**11.0000**	**26.1000**	**35.9750**	**9.9750**	**5.0500**	**3.0000**	**8.5000**	**9.9750**

Two-Sided Bandwidth — Spectrum Summary	Overall Gains/Losses (MHz)				
Nextel Plan B-I/LT Bandwidth Deficit (MHz)	0.0000	3.5000	2.0000	4.2500	7.0000
Additional PS Bandwidth From SMR/GC (MHz)	11.5000	0.2500	0.2500	0.7500	5.5000
Additional PS Bandwidth From B-I/LT(MHz)	5.0000	3.0000	1.7500	4.5000	0.0000
Relocation of NPSPAC (MHz)	-5.9750	-3.1250	-2.0000	-5.1000	-5.9750
Existing PS Bandwidth (MHz)	9.4750	7.3750	4.5000	10.8500	14.4750
Overall Public Safety Gains/Losses (MHz)	10.5250	0.1250	0.0000	0.1500	-0.4750
Total Public Safety Bandwidth (MHz)	20.0000	7.5000	4.5000	11.0000	14.0000

To further complicate matters, the 700 MHz Guard band spectrum is also encumbered in the Canadian border areas, due to Canadian Digital Television allotments, and a US/Canadian Letter of Understanding[14] that designates US 700 MHz Public Safely and Commercial services as secondary[15] to Canadian broadcast television services. The locations of the high-power, primary-class US and Canadian broadcast services that affect the usage of the 700 MHz guard bands are shown in Figure 6 (also see Appendix F). Figure 7 overlays these broadcast locations with the amount of spectrum from the guard bands that is required within each Canadian Region in order to relocate the displaced 800 MHz services. Clearly the potential for additional conflicts exists within this plan. It is for these reasons that we recommend that displaced licenses operating in Industrial, Campus, or Indoor locations be moved primarily to the 700 MHz guard bands, since they would be the least affected by interference from these broadcast services (as well as the least likely to cause interference to these same services).

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[14] LETTER OF UNDERSTANDING BETWEEN THE FEDERAL COMMUNICATIONS COMMISSION OF THE UNITED STATES OF AMERICA AND INDUSTRY CANADA RELATED TO THE USE OF THE 54-72 MHz, 76-88 MHz, 174-216 MHz AND 470-806 MHz BANDS FOR THE DIGITAL TELEVISION BROADCASTING SERVICE ALONG THE COMMON BORDER, September 22, 2000.

[15] "Until a separate agreement is reached on non-broadcast uses, such new services shall not claim protection from DTV stations or analog TV stations established in accordance with the existing Agreement." (Ref. Footnote 14)

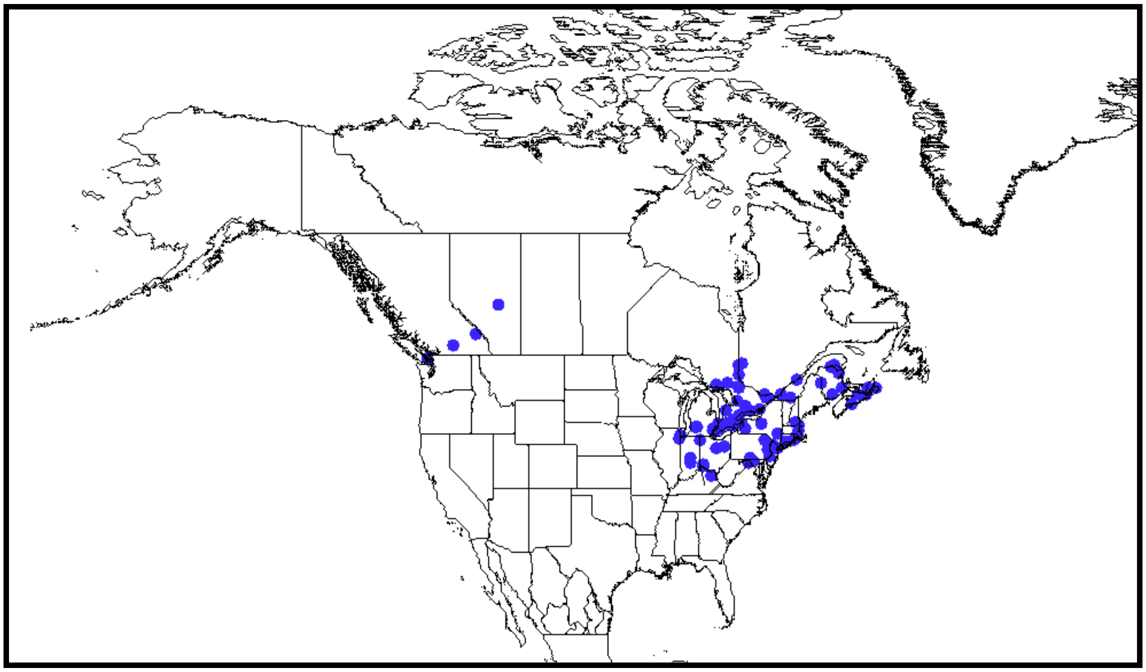

Figure 6: Broadcast Television Affecting Guard Band Usage

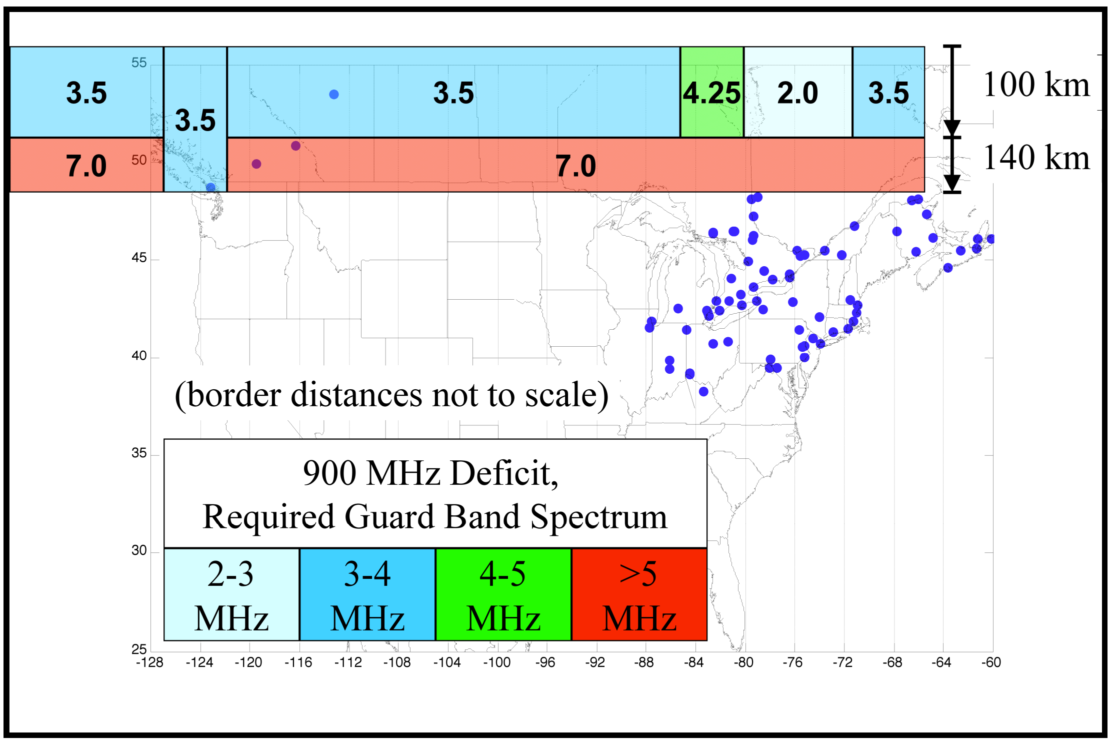

Figure 7: Television Affecting Guard Band Usage with 900 MHz Deficit Overlay

The availability of relocation spectrum is not the only issue with the Nextel proposal in the Canadian border Regions. As previously mentioned, Public Safety receives no significant additional spectral relief in these areas, and, in some regions, even experiences a net loss of spectrum. This is clearly illustrated in Figure 8, with additional material provided in Appendix A. It is important to realize that these Canadian border areas have some of the most critical needs for spectral relief, and that, in most of these areas, 700 MHz spectrum will not be available to provide this relief.

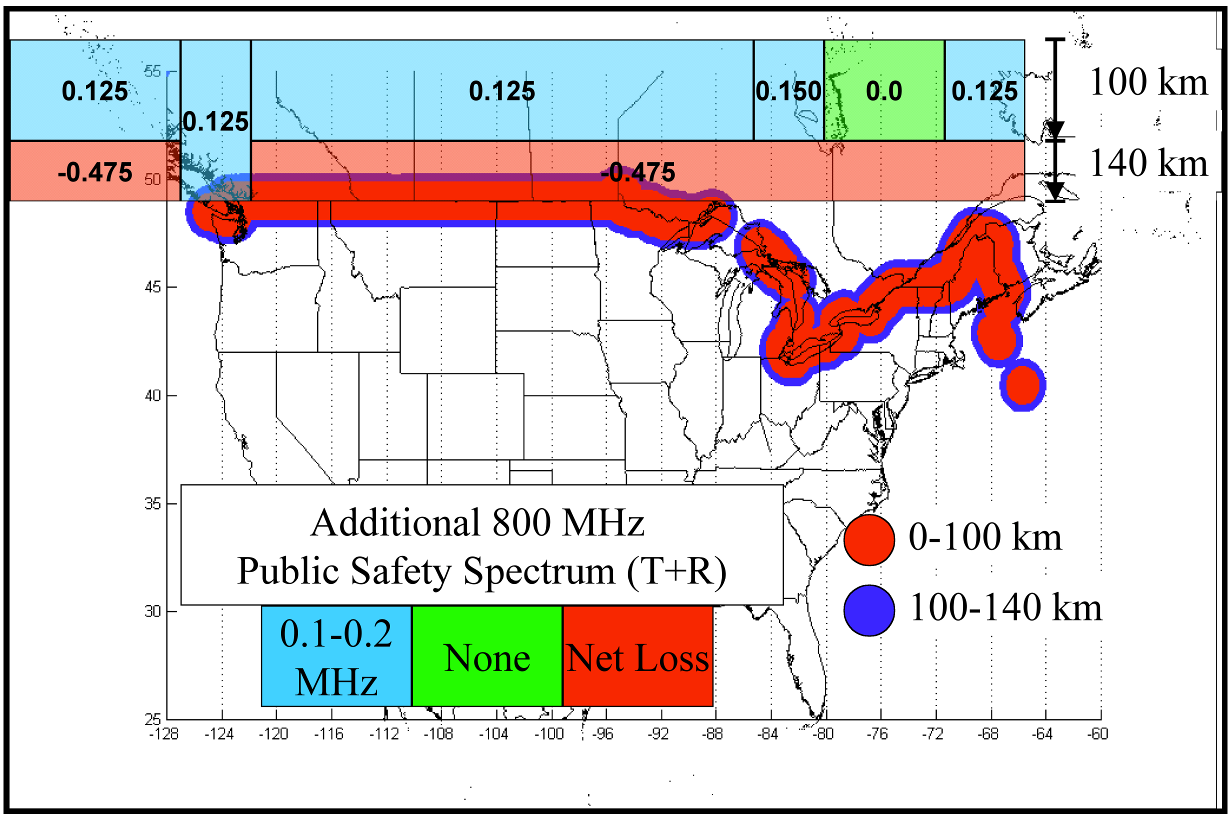

Figure 8: Additional 800 MHz Public Safety Spectrum Freed by Modified Nextel Proposal

3.2.4 Cost Reimbursements

An issue that New York recognizes as contentious within the Nextel proposal is centered on the cost reimbursement for both public safety and CMRS incumbents. We believe that it is critical that the Commission quickly initiates a cost-benefit study to address relocation cost reimbursement issues. Furthermore, Nextel's proposal of $500 million does not guarantee to fully reimburse public safety for the costs of relocation. If additional funds are required, the source of such funds must be guaranteed prior to plan acceptance. Therefore, we recommend that, if a variant or modification of the Nextel proposal is to be accepted, Nextel should be prepared to fully fund the relocation of public safety.

3.2.5 Summary

In summary, New York embraces certain portions of the Nextel proposal. The proposal represents an excellent first step toward alleviating interference within the 800 MHz band. Furthermore, outside of the Canadian border Regions, the Nextel proposal would provide some critical spectral relief — especially in the New York City area, which has had no spectrum in any band available for new licensing for many years. Spectral relief in this area is especially important: with no date set to mandate an end to analog television operations, the 700 MHz band can not be counted upon to provide relief in the near term, even perhaps out past 2010.

Because the Nextel proposal, as stated in the NPRM, does not adequately address Canadian border issues, New York can only give qualified support of the proposal. The State of New York therefore reserves complete judgment on the Nextel proposal until the time is appropriate for NYS Reply Comments, when additional analyses will document whether the Nextel plan could be adequately and reasonably modified to provide much needed spectral relief to Public Safety in the Canadian border areas.

Furthermore, we recommend that, if a variant or modification of the Nextel proposal is to be accepted, Nextel should be prepared to fully fund the relocation of public safety. If additional funds are required, the source of such funds must be guaranteed prior to plan acceptance.

4. SPECTRUM NEEDS OF PUBLIC SAFETY

The Commission has asked that public safety update and reiterate its needs for additional spectrum, especially in the light of the 700 MHz[16] and 4.9 GHz[17] public safety allocations, and the narrowband initiatives that have been implemented since the Public Safety Wireless Advisory Committee (PSWAC)[18] presented its findings to the Commission. Ironically, five years to the day that this landmark report on interoperability and public safety needs was completed, the World Trade Center and Pentagon were attacked by terrorists, resulting in the largest public safety interoperability and terrorism responses ever to occur within the US.

Within this section, New York will detail how the Commission's spectral relief initiatives have unfortunately failed to provide spectral relief where it has been needed most, resulting in a tremendous gap between public safety's needs and the available public service spectrum. In summary, New York believes that the Commission should welcome and support the opportunity to clear additional spectrum for public safety at 800 MHz and to use this proceeding as a catalyst to achieve this goal.

4.1 Lack of Canadian 700 MHz Harmonization

For several years now, New York has worked to facilitate 700 MHz harmonization between the US and Canada. Currently, Canada has placed Digital Television allotments in close

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[16] WT-Docket 96-86, Development of Operational, Technical, and Spectrum Requirements for Meeting State, Local and Federal Public Safety Communications Requirements through the Year 2010.
[17] WT-Docket 00-32, The 4.9 GHz Band transferred from Federal Government Use.
[18] Final Report of the Public Safety Wireless Advisory Committee, September 1, 1996.

proximity to the US and within the US Public Safety and Commercial 700 MHz allocations.[19] The magnitude of this problem is clearly illustrated in Figure 9, in which 100- and 200-km contours are referenced around the digital and currently operational primary class[20] analog television stations. These allotments have taken away much of the use of 700 MHz along the border with Canada from Eastern Michigan to Maine. The Commission has yet to negotiate a change to the Canadian Allotment Plan, and therefore 700 MHz harmonization and availability appears to be more than a decade away. For additional material, reference Appendices F, G, and H, which extensively cover the locations and interference aspects of these television services.

Despite the loss of the 700 MHz spectrum, international interoperability and border security are more important than ever, especially due to the role that they play in an a strong homeland defense network. Yet the State of New York has little spectral resources at 800 MHz to devote to these operations. It is clear that the FCC has left the State of New York with few tangible options for spectral relief in the border regions. We strongly believe that this proceeding should be utilized as an opportunity to free additional spectrum in the border areas to offset the loss of 700 MHz.

[19] It will likely only occur after the full Digital television transition in Canada, a transition that is yet to be defined.
[20] Class A, B, C, D, N. R. S, VL, or VU.

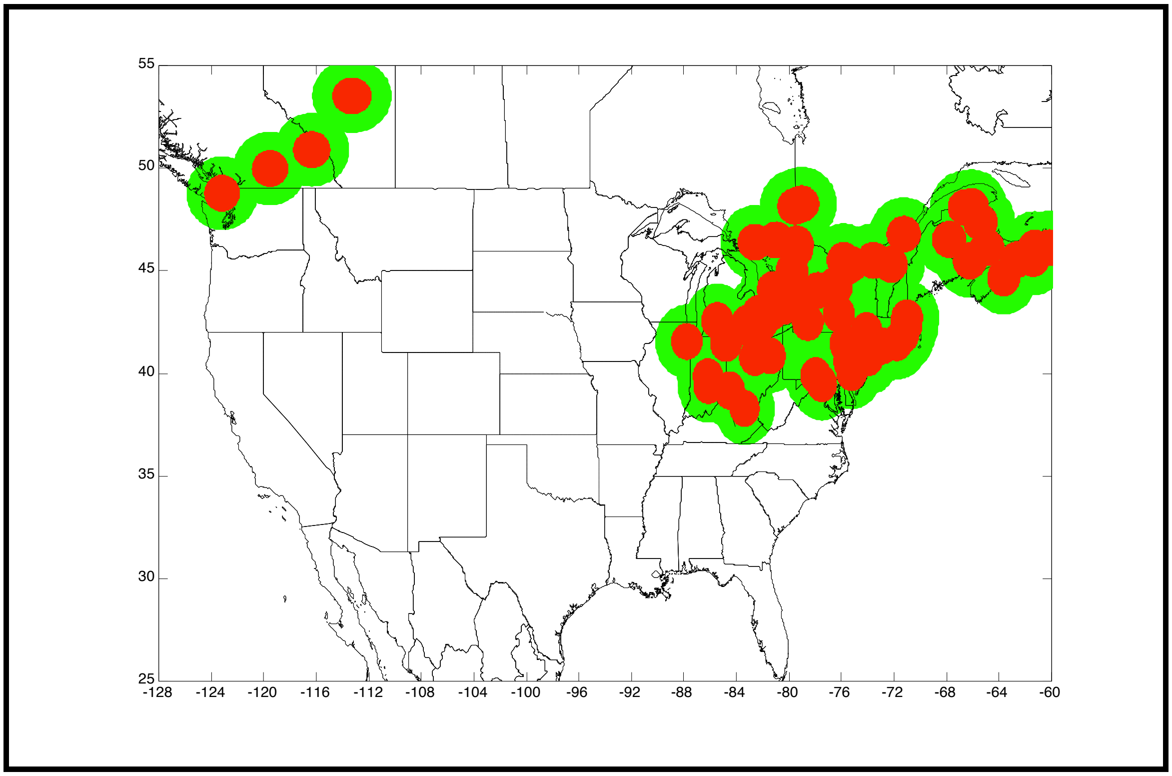

Figure 9: TV/DTV Affecting Public Safety 700 MHz in the Canadian Border Regions

4.2 Metropolitan Congestion, and US 700 MHz Blocking

The near- to mid-term availability of 700 MHz public safety spectrum is not any better in the lower half of New York State, particularly in the Metropolitan New York City area. Here, broadcast television permeates the 700 MHz public safety channels, very effectively blocking the availability of 700 MHz. This area is easily one of the most spectrally congested in the nation. However, with no date certain for DTV transition, there is also no date certain for public safety spectrum availability. Figure 10 illustrates the degree that current analog television 700 MHz is blocking 700 MHz in the vicinity of New York State. For additional material, reference Appendices F, G, and H, which extensively cover the interference aspects of these television services.

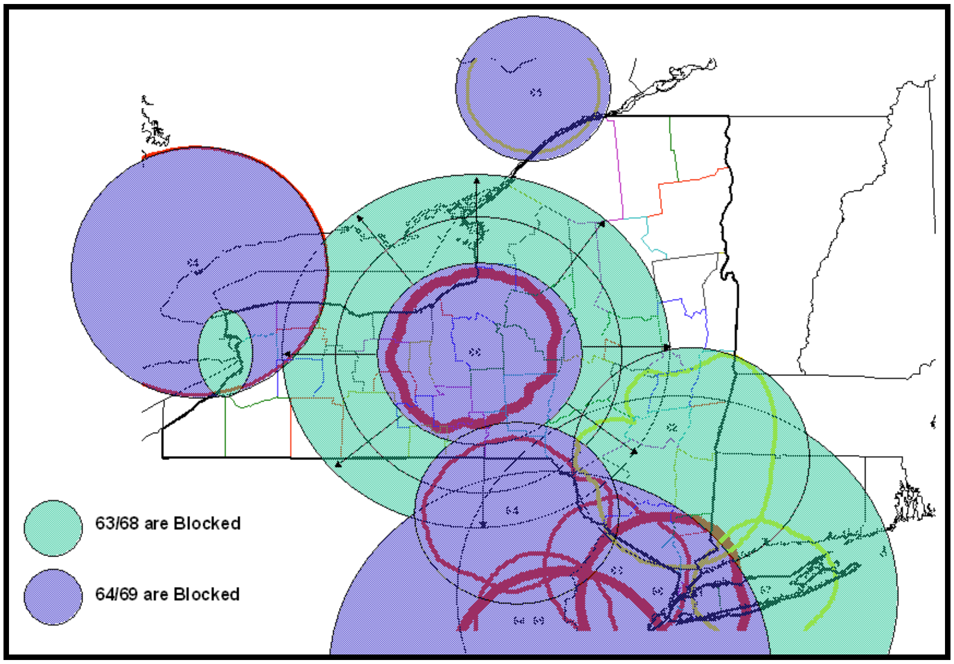

Figure 10: Currently Blocked 700 Hz Public Safety Spectrum - New York State

4.3 Public Safety's Needs in a Post-September 11th Era

On September 11, 1996, the Public Safety Wireless Advisory Committee (PSWAC) reported Public Safety's spectrum needs through the year 2010. The PSWAC Final Report in the Executive Summary, at page 3, stated:

- *More spectrum is required.*
- *Immediately, 2.5 MHz of spectrum should be identified for interoperability from new or existing allocations. In the short term (within 5 years), approximately 25 MHz of Public Safety allocations are needed. The present shortages can be addressed by making part of the spectrum presently used for television broadcast channels 60-69 available as soon as possible.*
- *Over the next 15 years, as much as an additional 70 MHz of spectrum will be required to satisfy the mobile communication needs of the Public Safety community.*

This projection was based on forward-looking estimates of spectrum efficiency. As reported in PSWAC's Spectrum Subcommittee Final Report starting at Appendix D - SRSC Final Report, Page 30 (636) {emphasis added}:

> ***7.2 Technology Subcommittee Input.*** *The Technology Subcommittee provided the expected state-of-the-art for the average installed system in 2010 as part of the basis for generating spectrum estimates. The Technology Subcommittee has stressed these technology estimates are quite aggressive —* ***thus any spectrum estimate based upon them will be correspondingly conservative.***
>
> ***7.2.1 An Example.*** *The technology forecast provided estimates that the public safety voice radio system in use in the year 2010 would require* ***an average of*** *4 kHz of spectrum per active conversation[2]. Realistically, this high level of efficiency could only be achieved by universal replacement of existing equipment and the widespread deployment of public safety systems more spectrum efficient than any on the market today.*
>
> > *[2.] The value of 4 kHz per voice channel is based on an offered load of 6 kb/s for digitized voice today, and, by the year 2010, an improvement in coding of 2:1, the use of error-correcting code and overhead that requires double the offered load, and a transmitted rate (or modulation efficiency) of 1.5 b/s/Hz.*
>
> ***7.2.2 Impact of Projection.*** *To put this requirement in perspective, assume that the older one-fourth of installed equipment in 2010 operates with a spectrum efficiency of 12.5 kHz per speech path (the level required for new type acceptances today under the FCC's refarming rules, but not yet in significant use in public safety). Then, if the forecasts of the Technology Subcommittee are to be met, the other three-quarters of equipment must operate with a spectrum efficiency of 1.17 kHz per speech path (roughly twenty times more efficient than today's typical practice). This discussion considers one specific technological element, voice transmission. The forecasts were similarly aggressive in other areas such as data modulation, video coding improvement, etc.*

To illustrate the point in the paragraph above about public safety spectrum need as a function of spectrum efficiency, it should be noted that currently "Project 25" (ANSI-102) compliant radios offer frequency division multiple access (FDMA) technology and are available to meet public safety digital communication needs in 12.5 kHz channeling, but only have a 0.768 b/s/Hz spectrum efficiency. Radios compliant with Project 25 should be available with a spectrum efficiency of 1.536 b/s/Hz at some time in the future, but such systems have not been marketed and implemented as of this time. While TETRA (Terrestrial Trunked Radio) digital radios, used by public safety in Europe and other places around the world, offer a 4-slot time division multiple access (TDMA) technology with a spectrum efficiency of 1.44 b/s/Hz, they have not been available in North America to date because of restrictions imposed on the licensing of certain Intellectual Property Rights.

There was a considerable investment in time and money by Public Safety entities and others in the one-year process to develop the PSWAC Final Report. Since that report, the Commission only temporarily allocated 6 MHz of public safety spectrum to the New York City Metropolitan Area (482-488 MHz). It has allocated 2.6 MHz designated for interoperability at 700 MHz — well above the frequency limit requested by PSWAC. Also, it recently designated for interoperability four (4) reallocated narrowband simplex channels in VHF and four (4) reallocated narrowband duplex channels in UHF — for an addition of 300 kHz of spectrum of the 2.5 MHz of interoperability spectrum below 512 MHz that PSWAC had requested. The Commission has yet to allocate more than a portion of the 25 MHz of immediately required spectrum for public safety operational use — which, at 700 MHz, is not usable in the spectrum-starved NYC Metropolitan Area because of incumbent broadcast operations. Moreover, with eight (8) years left until 2010, the remaining more than 70 MHz PSWAC requested remains unfulfilled. Hopefully, the Commission will recognize these facts and take advantage of the current proposal to provide additional, badly needed spectrum for Public Safety that will effectively integrate into the development and expansion of Public Safety systems and have near-term availability. However, in this NPRM, the Commission seeks yet another analysis of Public

Safety spectrum needs. Considering that PSWAC spent an entire year making a very extensive analysis of spectrum needs based upon forward-looking spectrum efficiencies that have not been achieved to date, it is not realistic to expect that yet another study can be completed in only 30 days as contemplated in this NPRM. The Commission would be well advised to re-read the PSWAC Final Report, including its Subcommittee Final Reports.

Public Safety has been on a heightened state of alert continuously since September 11, 2001. Local law enforcement has taken on additional roles, now patrolling and protecting nuclear power plants, airports, and other critical infrastructure resources. They have also needed to maintain a heightened presence in the overall community and along the international border in order to thwart terrorist attacks upon our populace. There is also an additional need for Federal interoperability with the National Guard providing a primary public safety presence in our airports as well as augmenting local law enforcement support at nuclear facilities. All Public Safety, Fire, EMS, and Police now require the resources not only to interoperate, but also to support operations under the most extreme conditions — conditions that unfortunately are more likely than ever before, given the current state of alert.

Due to all of these issues, Public Safety still has a critical need for additional spectrum to support its operations. In the NPRM, the Commission has indicated that, since the PSWAC report, it has provided the 700 MHz and 4.9 GHz allocations and has also adapted a narrowband initiative below 512 MHz. While New York does not disagree with the Commission in principle, little to no additional operational spectrum has actually been realized. The recent 700 MHz allocation will provide some relief. Its availability, however, is currently blocked in many areas of the US, including most of the major metropolitan areas. Additionally, there is no date certain set for when this spectrum will be available for use by public safety. Furthermore, 700 MHz may also be blocked more than a decade in many Canadian border areas. The recent 4.9 GHz Public Safety spectrum allocation will prove invaluable for providing tactical wireless LAN and WAN types of services to Public Safety. However, its range is too limited to support the narrowband voice and data operations that are more operationally typical to Public Safety. Again, the Commission has pointed to its narrowbanding policies as providing additional Public Safely spectrum. While these policies are to be commended, narrowbanding has not been able to free spectrum at 800 MHz, where most Public Safety spectrum is located. Therefore, narrowbanding has offered little in terms of achieving interoperability at this band.

4.4 Current Availability of 800 MHz Public Safety Spectrum

Further detailed analysis was performed for both the NPSPAC and "old-block" Public Safety allocations. The approach taken was most likely one of the most thorough, accurate, and advanced approaches to determining spectrum availability that has been applied to date, utilizing realistic propagation and terrain characteristics, frequency reuse factors, and preliminary system design parameters.[21] The results clearly indicated that there was little or no spectrum available in either of these bands in two particular areas of the State — the Canadian border Regions and the vicinity of New York City. An explanation of the methodology used is presented in Appendix I, along with detailed results.

[21] The exact methodologies that New York State used to investigate the availability of 800 MHz public safety spectrum within its borders are discussed in Appendix I.

4.5 The New York Statewide Wireless Network (SWN) Project

In April 2000, Governor Pataki formed the SWN project, under the auspices of the New York State Office for Technology, to address the critical need for a new statewide emergency communications system. The present public safety communications infrastructure throughout New York State is often obsolete or outmoded, and systems differ substantially between agencies and levels of government. The SWN project will develop and implement an integrated statewide mobile radio network to provide a common communications platform for 65,000 public safety and public service users.

The SWN will incorporate the latest technologies in land mobile radio and coordinate the use of additional bandwidth reserved for public safety. The design will provide a digital trunked radio network for both voice and data transmission. The trunked design will allow for autonomous talk groups among the various participants, as well as the capability to designate special or ad hoc talk groups for large-scale emergency situations. Voice and data encryption will ensure that public safety communications are secure.The SWN will benefit emergency responders and law enforcement and public service providers at all levels of government. Anticipated SWN participants include some twenty-nine State-level agencies and public authorities, The State University of New York (SUNY) system, and the Judiciary. All counties[22] and New York City have expressed interest in the SWN. Formal partnerships will be developed at the option of local entities. At a minimum, the SWN will provide communication gateways to all public safety systems within the State that request it.

[22] Thirteen counties and NYC have requested immediate involvement in a SWN pilot project.

The September 11th tragedies, and other large-scale emergencies in recent years, highlight the need for all responding agencies with different systems and frequencies to be able to talk to each other. One of the major goals of the SWN is to enable agencies at all levels of government to communicate and coordinate with each other during disaster situations and their aftermaths. In addition to the infrastructure and coverage capacity inherent in the SWN, effective interoperable communications for crisis situations will be provided. Statewide Public Safety Communications systems[23] such as SWN are characterized by their operational interoperability, offering an effective weapon against terrorism, and providing one of the most critical[24] tools for border security and homeland defense.

However, as noted in Section 4.4, there is very little 800 MHz spectrum available to support SWN operations — especially in the Canadian border areas and in the vicinity of New York City. Unfortunately, as noted in Sections 4.1 and 4.2, these latter areas (as well as much of the State) have 700 MHz availability also blocked, and in the border areas this blockage may last for more than a decade. Figure 11 illustrates areas where SWN's capacity[25] needs cannot be supported through currently available 800 MHz spectrum, and illustrates, by color coding, the fractional capacity attained. (Note the arrows pointing to the substantial number of blue dots —

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[23] Other states implementing or operating these systems include Ohio, Michigan, Pennsylvania, and Florida.

[24] Information is the key component to combating terrorism, and an integrated multi-agency network is one of the most effective ways to providing information agility to the Public Safety community - which represents the primary component of our homeland defense efforts.

[25] Appendix J documents the methodology that New York State used to model the capacity requirements for its statewide public safety wireless communications system. The approach taken is most likely one of the most thorough, accurate, and advanced approaches to modeling

representing low achievement — in the vicinity of New York City and along the US-Canadian border below Lake Ontario.) It is clear that, without 700 MHz, SWN will require some type of additional 800 MHz spectrum. New York feels that the Commission must utilize this proceeding to offset the loss of 700 MHz that is felt by many Canadian border states, as well as to bridge the gap to fulfilling the spectral needs of Public Safety during the US DTV transition process. See Appendix J for additional information and reference material.

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traffic distributions and determining statewide public safety capacity requirements that have been applied to date.

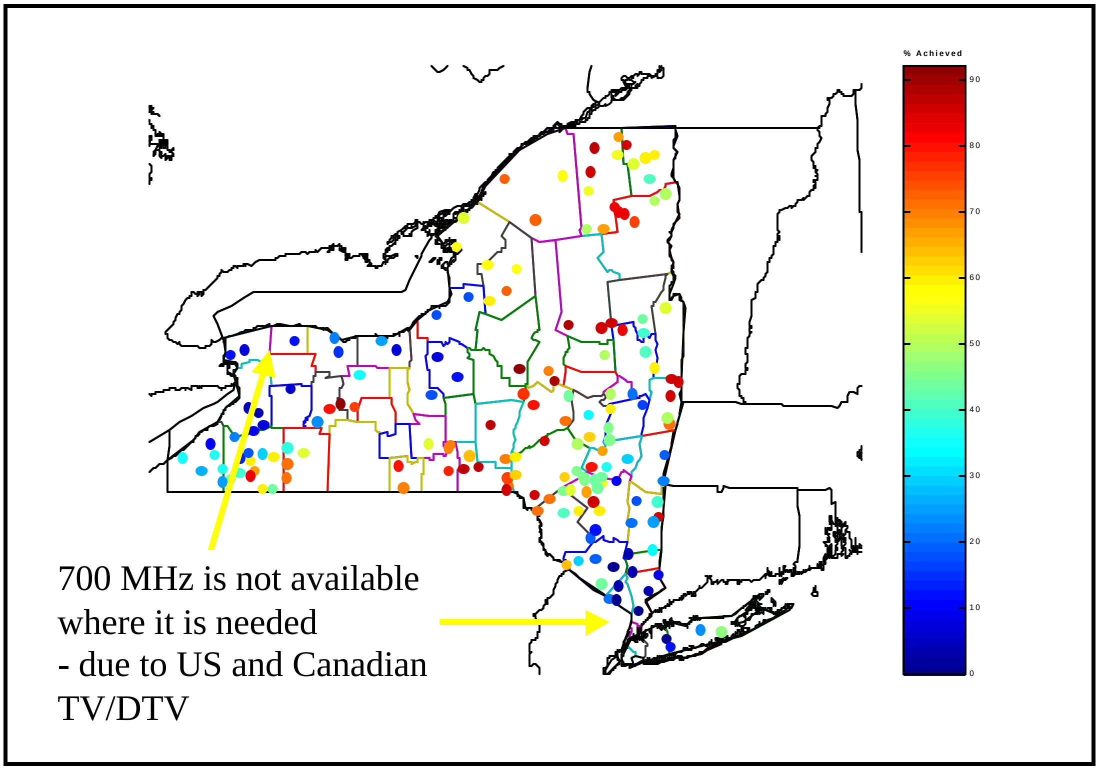

Figure 11: Areas where 800 MHz Spectrum Does Not Meet SWN Capacity Estimates

5. Licensing and Frequency Coordination for a De-Interlaced Band

The Commission is soliciting recommendations on the spectrum management issues raised by de-interlacing the services within the 800 MHz band. In this section we present our recommendations for how this could be accomplished within the framework of existing Regional Planning and Frequency coordination, but with a more modern aspect included to enhance spectral reuse on a National basis.

5.1 Super Regional Planning Committee

As indicated in Section 3, New York believes that the Nextel proposal offers the opportunity to "re-pack" and "re-pool" all NPSPAC spectral allotments, along with an additional 10 MHz of spectrum. This would optimize the spectral reuse of the entire band, free additional spectrum, and relieve some of the burdens placed upon the 800 MHz Regional Planning Committees by offering them fresh pre-allotted pools which they can use to respond to new applicants.

In essence, instead of a "Super-Coordinator" as discussed by the Commission, we propose that the first step of the spectrum relocation process ("re-pack") be performed by a "Super Regional Planning Committee" (SRPC), composed of representatives of Public Safety entities, Public Safety Coordinators, and existing NPSPAC Regional Planning Committees. Under such a plan, a single entity — using advanced spectrum management tools — would provide a new frequency assignment to each relocated NPSPAC licensee. These new assignments would minimize interference with not only existing services, but also all relocated services, and these assignments would be generated by optimizing (jointly minimizing interference and maximizing reuse) the entire country simultaneously.

Once all of relocated licensees have a new assignment, the second step of the spectrum relocation process (“re-pool”) would then be performed. In this step, the same method could be applied to identify and characterize additional pool allotments that would be distributed to the 800 MHz Regional Planning Committees, so that the spectrum could be quickly made available in response to new license requests.

The combination of the “re-pack” and “re-pool” processes would offer enhanced spectral reuse and minimal interference on a national scale, and save the Regional Planning Committees a tremendous amount of effort. It also would free additional spectrum by optimizing frequency reuse on a national basis, thus improving geographic spectral efficiency. The methodologies applied would be debated and agreed to by the Super Regional Planning Committee. This approach draws heavily on the precedent set by the advanced methodology and spirit of cooperation characterizing the joint generation by the National Public Safety Telecommunications Council (NPSTC) and the National Institute of Justice (NIJ) of pool allotments for the 700 MHz Pre-Coordination Database, and continues forward with this fair standard of spectrum management. We envision that the costs incurred by the generation of SRPC and the National “re-pack” and “re-pool” processes would be paid for as part the financial relocation compensation package offered by Nextel.

5.2 Regional Planning Committees

As discussed, the Regional Planning Committees would have two major roles in the band de-interlacing process. First they would offer representation to the Super Regional Planning Committee so that their concerns are represented within the relocation process. Second, they would continue to act as the 800 MHz Regional Planning bodies. In this capacity, they would have a new allotments pool to draw upon to quickly and effectively assign the new public safety spectrum to applicants. Eventually, as the current 25 kHz public safety channels transition to narrowband operation, the RPCs would become the primary coordinating body for the entire 800 MHz public safety allocation. This will allow for consistency in spectrum management across the entire 800 MHz band.

5.3 Frequency Coordination

The final spectrum management process for the relocation of Public Safety licensees would be frequency coordination. We propose that this be handled similarly to the way it is currently done at NPSPAC — with the exception that, for initial relocation, the new frequency assignments would come from the Super Regional Planning Committee. These would be distributed directly to the current licensees, who would then turn to an authorized Public Safety Frequency Coordinator to complete the licensing process. We envision that the fee structure for these frequency coordination services would be similar to that for NPSPAC spectrum, and that these fees would be paid for as part the financial relocation compensation package offered by Nextel.

6. COMPLEMENTARY MEANS OF REDUCING INTERFERENCE

6.1 Receiver Standards

The commission notes that the NCC (National Coordination Committee) has recommended ANSI Class-A receiver standards for the 700 MHz band Interoperability Channels[26]. The State of New York agrees that the adoption of ANSI Class-A receiver specifications in the 700 MHz Interoperability Channels does not place an undue burden on the community at large, and offers the highest level of performance and inference rejection.

The issue of legacy equipment complicates the adoption of Class-A receiver standards at 800 MHz, since this will necessitate the replacement of large inventories of legacy equipment, placing undue financial burdens upon the end users. For example, because most of the incumbents in the 800 MHz Public Safety lower 70 interleaved channels would not need to be relocated under the Nextel proposal, those systems should be allowed to operate "as-is"[27]. However, we also believe that restructuring of the 800 MHz band is essential, and further recognize that many public safety agencies will continue to utilize legacy equipment that will only require "re-tuning" or reprogramming for operation on their new frequency assignments. In summary, the State of New York feels that the Commission should allow for all legacy equipment to continue operating over its usable life. Note, however, that later in this response we indicate that all <u>new</u> licensees within the band would be required to operate at 12.5 kHz spectral efficiency with an eventual migration to 6.25 kHz equivalent spectral efficiency. This may have an effect on receiver

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[26] 74, FCC 02-81.

standards with regards to common air interface requirements if the Commission designates any digital interoperability channels.

The State of New York recommends the following course of action, which we believe would provide the most flexibility to public safety end users. During the Frequency Coordination/Regional Planning processes, tailor all spectrum management activities around the assumption of ANSI Class-A receiver performance and let all end-users individually decide what trade-offs between performance and equipment costs are acceptable. This would allow the end users to essentially purchase the level of performance that they require. If the choice is made to utilize receivers that do not meet Class-A performance standards, the users either can accept the interference that may or may not result from that decision or can update their equipment to reflect Class-A standards.

6.2 Out-of-Band Emissions Requirements for Commercial Spectrum

In order to protect Public Safety from spectral splatter and spillover, we recommend that, at a minimum, the 700 MHz Commercial out-of-band emission (OOBE) requirements be applied to the CMRS services in the new 816-824 MHz block. However, we ask that this be modified so that the OOBE requirements are measured as power coupled into a 12.5 kHz channel, such as is predominantly utilized in the 800 MHz public safety spectrum. The following are recommendations that would apply to any location with the Public Safety allocations[28]:

- CMRS Base & Fixed: 76+10log(P), into *12.5 kHz* and

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[27] Until narrowbanded - see Section 8.1.
[28] For example, under the Nextel Proposal, 806-616 MHz/851-861 MHz.

- CMRS Mobile & Portable: 65+10log(P), into *12.5 kHz*.

Note that, if it was the Commission's intention at 700 MHz to allow each interferer to be allowed to rise (in-band) to the level of the public safety thermal noise floor, then the degradation from multiple sources can dramatically decrease public safety sensitivity levels and, therefore, coverage. This is why we ask that this 1) be a minimum requirement and 2) apply to the 12.5 kHz channel case, essentially making the requirement more stringent by 3 dB. Further supporting information is provided in Appendix K.

6.3 Frequency Coordination

There may be additional ways of mitigating interference that could be dealt with at the Frequency Coordination level. Specifically, the Commission has requested comment on whether intermodulation effects should be taken into account during frequency coordination, and whether an increase in the service contour levels would help Public Safety reduce interference levels.

We believe that considering intermodulation during frequency coordination would decrease the number of new cases of interference occurring between public safety systems. However, the actual degree that this would reduce interference is difficult to ascertain. One thing that is clear is that intermodulation considerations are likely to reduce the available frequency pool at any given location, and therefore would result in a net loss of usable spectrum. For this reason, we do not believe that intermodulation should be a factor during frequency coordination. Furthermore, we believe that many cases of intermodulation could be either avoided or reduced by the proper design and selection of transmitter and receiver equipment.

It has been noted recently that there is rising support in the public safety community for raising the maximum power at the Public Safety service contour by 10-12 dB (or more). As discussed in Sections 2 and 3, Public Safety's operational requirements for high reliability and for portable and in-building coverage are leading to a point where higher power signal levels are required throughout Public Safety's service areas. This also directly leads to interference-limited system designs. New York agrees that these operational requirements are real and that raising the edge of service area power levels is one solution to this problem. However, interference-limited Public Safety designs may interfere with the typical (and existing) noise-limited system designs whenever the service areas and infrastructures of these systems overlap each other. This will either result in 1) public safety interfering with public safety in a manner for which this NPRM and its band de-interlacing strategies are attempting to provide a solution or 2) forcing much of public safety eventually into interference-limited system designs. The second point is of some concern, since these designs often result in increased siting and system costs, which are heavy burdens for Public Safety to carry. We believe that, while a higher-level service contour value has some merit, we would like to see an approach that allows for both noise- and interference-limited systems to coexist without interference. This will allow individual public safety agencies to have some financial and budgetary flexibility when deploying their systems. This is especially true for statewide systems, which most often design for noise- and/or terrain-limited mobile coverage[29].

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[29] Implementing a Statewide Public Safety system with portable and in-building coverage can be practically impossible in terms of financial, environmental, and budgetary constraints. Therefore, these systems most often are designed to provide mobile coverage only. Mixing these system with cellular-type interference-limited Public Safety systems (such as local or municipal) without regards to the possible effects would create tremendous coverage problems for the statewide

systems. Furthermore these coverage issues would likely arise in populated areas, where serious incidents are more likely to occur.

7. RE-BANDING ISSUES

Within this section we respond to issues related to re-banding the 800 MHz band to mitigate against the interference issues and to provide additional spectrum for Public Safety.

7.1 Relocation Cost to Public Safety

As indicated in Section 3.2, the issues that New York recognizes as the most contentious in the Nextel proposal are centered on the cost reimbursement for both public safety and CMRS incumbents. We believe that it is critical that the Commission quickly initiates a cost-benefit study to address the financial reimbursement issues. Furthermore, although Nextel's offer of $500 million is generous, it is not guaranteed to fully reimburse public safety for the costs of relocation, which would include the costs of re-tuning, reprogramming and replacing radio and antennas system equipment. These costs would include those related to generation the proposed SRPC (and to perform the national "re-pack" and "re-pool" tasks), as well as all fees associated with frequency coordination services incurred during the relocation of the NPSPAC band licenses. In short, we recommend that Nextel be fully prepared to fund the total relocation of public safety. If additional funds are required, the source of such funds must be guaranteed prior to plan acceptance.

7.2 Requirement for a Guard Band

With regards to Nextel's proposal, the Commission has requested comment on the requirements for a guard band between the transmitter portions of the new public safety and

CMRS spectral blocks, with the understanding that this 800 MHz guard band would come from the public safety allocation of the spectrum.

New York does not believe that Public Safety should have to give up spectrum in order to avoid interference from Commercial providers transmitting wideband signals with far-reaching interference. Therefore, we believe that the idea of a large guard band coming out of the public safety spectrum is inappropriate and instead look toward a solution that makes the CMRS, particularly ESMR, providers responsible for their own spectral purity. One such solution would be to place strict OOBE requirements on these services and to require that these requirements hold in any location within the Public Safety spectrum.

7.3 Schedule, Roadmap and Disruption of Services During Transition

New York has stated that the Commission should take this opportunity to re-band the 800 MHz spectrum in order to mitigate interference and free additional Public Safety spectrum. We realize, however, that this will undoubtedly lead to disruption of some services. In response to the Commission's request for comment on the schedule, roadmap and disruption of services during the transition period, New York reserves response until it submits its reply comments. This is due to the fact that no realizable proposal has yet been introduced[30].

[30] Again, the Nextel proposal has significant merit, but needs to be modified in the Canadian border regions in order to make it tractable.

8. RULES FOR THE NEW ALLOCATION

New spectrum brings new rules and regulations and the opportunity to reform and update previous rulings. In this section, New York welcomes the opportunity to present its views on how the additional spectrum freed during the re-banding process could be regulated.

8.1 Narrowband Migration

If the NPSPAC spectrum were to be consolidated with the "old-block" Public Safety spectrum, we would have the opportunity to consider the eventual narrowbanding of all Public Safety 800 MHz spectrum to 6.25 kHz equivalent spectral efficiency. New York suggests that, to immediately free additional public safety channels in this band, all new licensees would receive 12.5 kHz channel assignments based upon a band plan similar to the 700 MHz public safety band[31]. Furthermore, as the 800 MHz public safety band eventually reaches channel saturation, operations could be transitioned to 6.25 kHz effective spectral efficiency. At this point, the only operations that would be authorized to operate in the wider (12.5-25 kHz) bandwidths would be those that maintain <u>at least</u> a 6.25 kHz effective spectral efficiency. This would eventually offer up to a four-fold increase in available public safety channels at 800 MHz.

8.2 Interoperability Channels

One critical aspect of the relocation of the NPSPAC band is that the mutual-aid (interoperability) channels would need to be moved. This would need to be coordinated on an international basis. The total number of Public Safety interoperability channels within a re-banded 800 MHz would depend upon the amount of additional spectrum that is made available to public safety. At a minimum, the five existing international mutual-aid channels would need to be re-designated within the new allocation and remain at a bandwidth of 25 kHz for analog operations. While the Commission may also wish to designate new interoperability channels in this band, it should consider that 1) the 700 MHz band already promises 1.6 MHz of similar spectrum and 2) the 2.5 MHz of interoperability spectrum requested by PSWAC was for operation *below* 512 MHz. If the Commission still wishes to create new interoperability channels in this band, then these should be designated as 12.5 kHz channels and dedicated to digital mode operation. Furthermore, new 12.5 kHz digital interoperability channels will necessitate that two distinct common air interfaces will need to be defined within the band.

8.3 Interoperability Channel Common Air Interface (CAI)

In a re-banded 800 MHz band, existing equipment would be capable of supporting operation on the interoperability channels relocated from the NPSPAC allocation[32]. The common air interface for this mode will remain 25 kHz analog FM to accommodate the embedded base of 25 kHz analog systems.

If the Commission designates new digital interoperability channels as described in Section 8.2, all new type-accepted equipment for operation in this band must be capable of operation anywhere within the designated interoperability channel sets (analog and digital), and should do

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[31] That is, channelized using a 6.25 kHz basic channel width, which can be aggregated to 12.5 and 25 kHz.

[32] Relocated from the former NPSPAC allocation.

so utilizing the appropriate common air interface. Because of the precedent set in 700 MHz[33], the ANSI-002 digital standard should serve as the CAI standard for operation on the digital interoperability channels.

[33] 47 CFR §90.547 and §90.548

9. CONCLUSION

In conclusion, reorganizing and consolidating the 800 MHz band is required to mitigate against a number of issues that exist both nationally and within New York State. Further, public safety has an immediate need for additional spectrum within which it can operate. This is particularly true in New York State, and especially along the Canadian border and in the metropolitan New York City area.

In this response, the State of New York has addressed the issue of 800 MHz interference and its causes, and concurs that this interference must be resolved. We have commented on the ability of de-interlacing strategies to effectively mitigate against the interference problems, and have provided detailed analyses and specifically addressed the NAM and Nextel proposals. New York supports the essence of the Nextel proposal, outside of the international border regions, but has identified critical shortcomings within the Nextel plan in the Canadian border regions. Therefore, we conclude that an alternative proposal must be developed to effectively deal with Public Safety requirements and the international sharing agreements in these border areas. New York has also demonstrated that public safety has critical near- and long-term spectrum needs that remain to be addressed. If the entire 800 MHz band in to be de-interlaced, New York has discussed means of handling the spectrum management, relocation and re-coordination of the band. We have also recommended complementary means to reduce interference. We note that an eventual narrowband migration of all 800 MHz Public Safety channels will free additional spectrum and request that any band reorganization reflect, at a minimum, 12.5 kHz spectral efficiency for new operations — with an eventual migration to 6.25 kHz spectral efficiency. We believe that, in the event of a band reorganization, there is a critical need for new 25 kHz analog interoperability channels to replace the NPSPAC International Mutual Aid channels. We provide comment on a possible set of new narrowband (digital) interoperability channels. Finally, in the event of band reorganization, New York asks for a requirement that all new type-accepted public safety equipment within the band be able to operate on the analog interoperability channels utilizing an analog FM common air interface, and, if digital interoperability channels are adopted, on digital channels using a digital common air interface consistent with 700 MHz operations.

In closing, we applaud the Commission for its diligence in acting to mitigate against the interference within this band, and its willingness to further consider freeing additional Public Safety spectrum in the process. Again, the State of New York urges the Commission to use this proceeding as a vehicle to provide near-term spectral relief to public safety — relief that is desperately needed to protect our citizens, implement a new Statewide Wireless Network, and provide homeland defense and security in an age where the security and safety of our people can no longer be taken for granted.

A. 800 MHz Public Safety Spectrum in the Canadian Border Regions

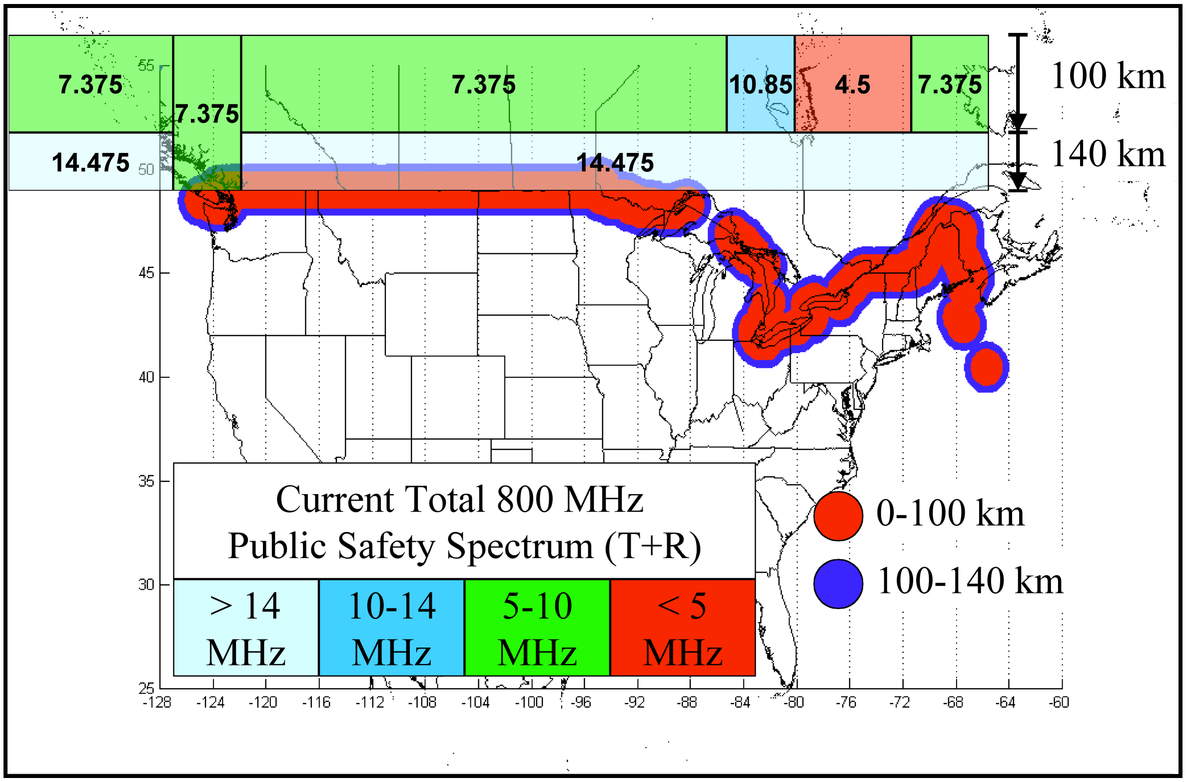


Figure A-1: Current Total 800 MHz Public Safety Spectrum

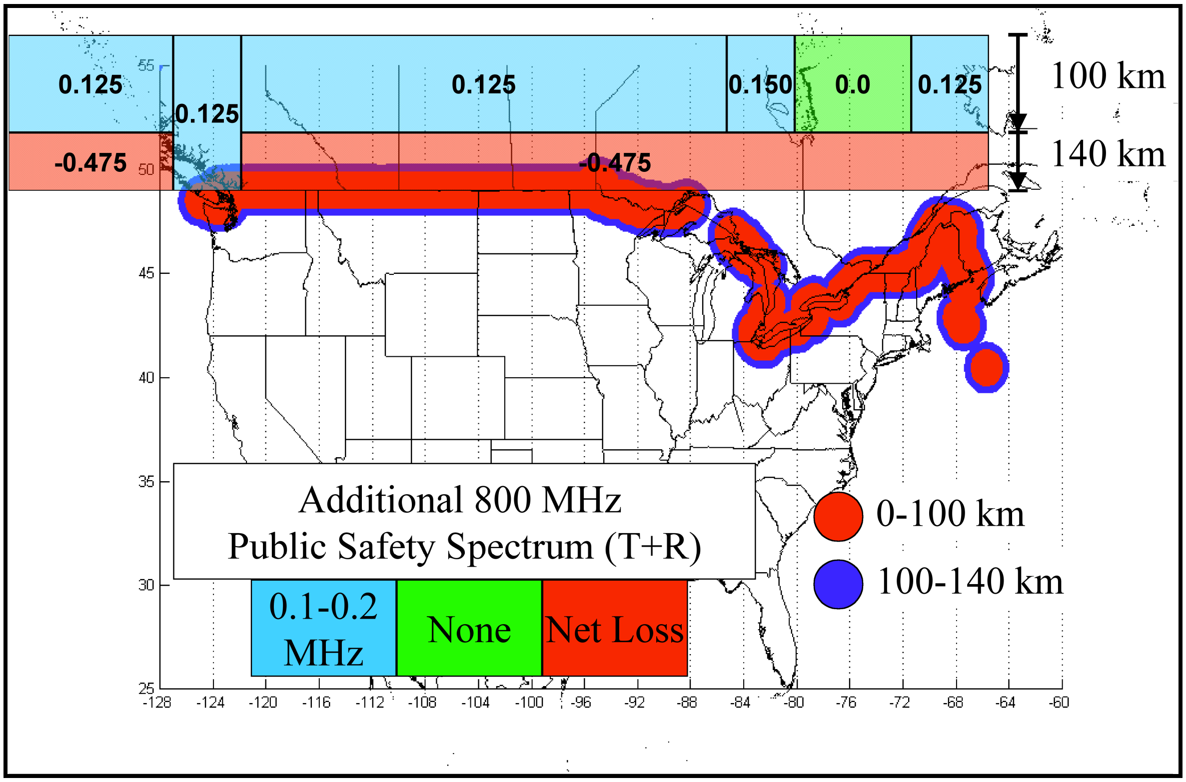


Figure A-2: Additional 800 MHz Public Safety Spectrum Freed by Modified Nextel Proposal

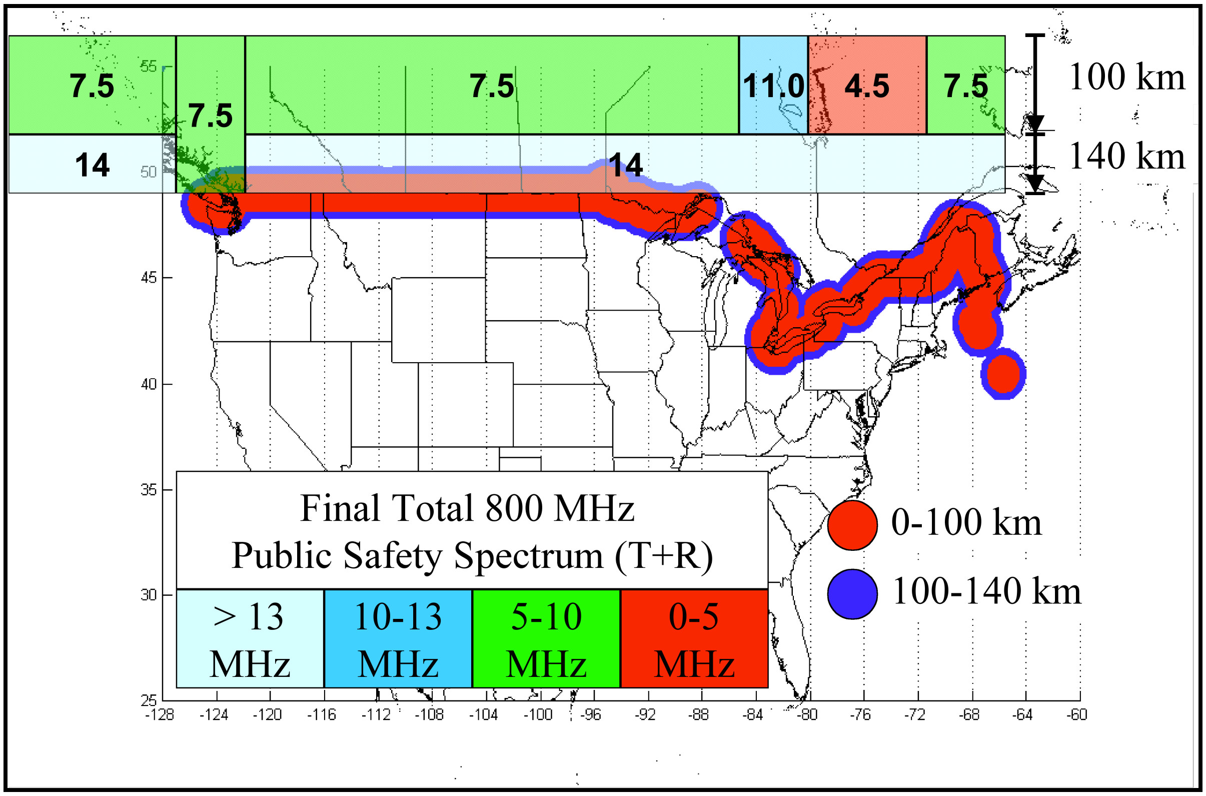


Figure A-3: Final Total 800 MHz Public Safety Spectrum Freed by Modified Nextel Proposal

B. 800 AND 900 MHz BAND PLANS - CANADIAN BORDER REGIONS I, IV, V, AND VI

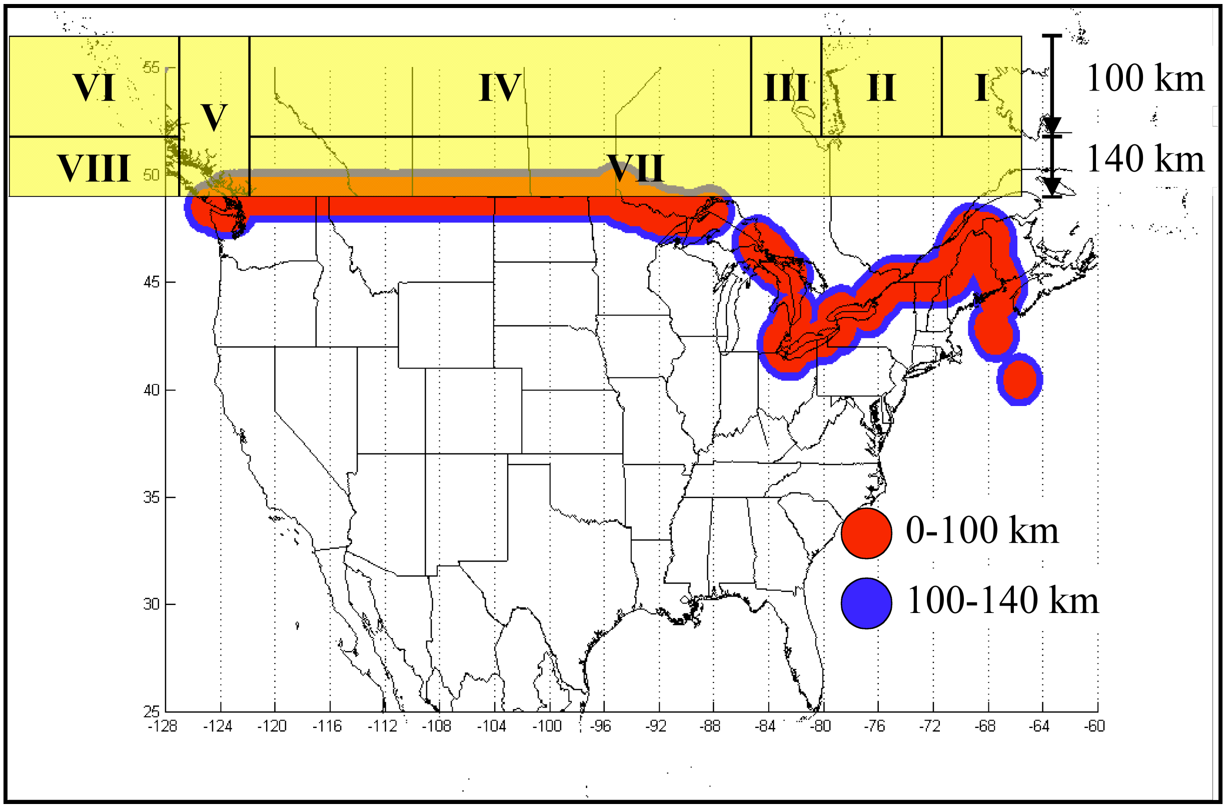


Figure B-1: Canadian Regions I, IV, V, and VI

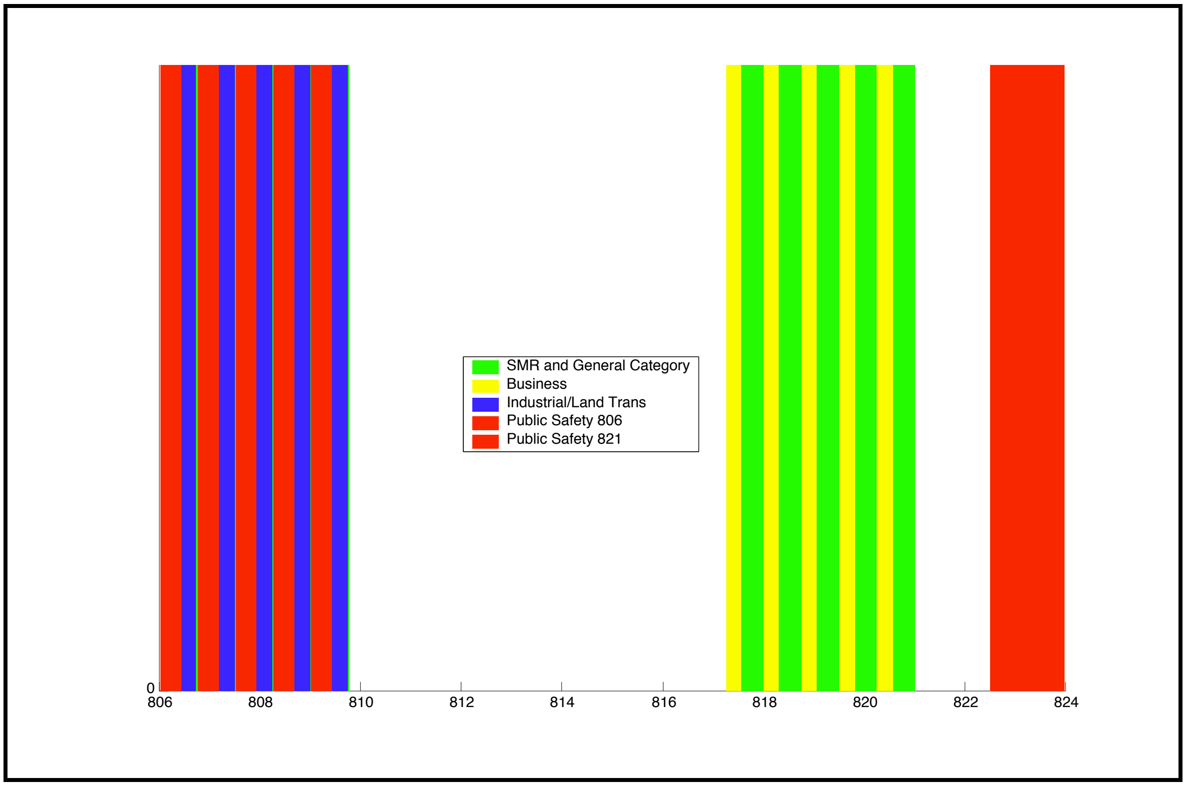


Figure B-2: US 800 MHz Band Plan, Canadian Regions I, IV, V, and VI

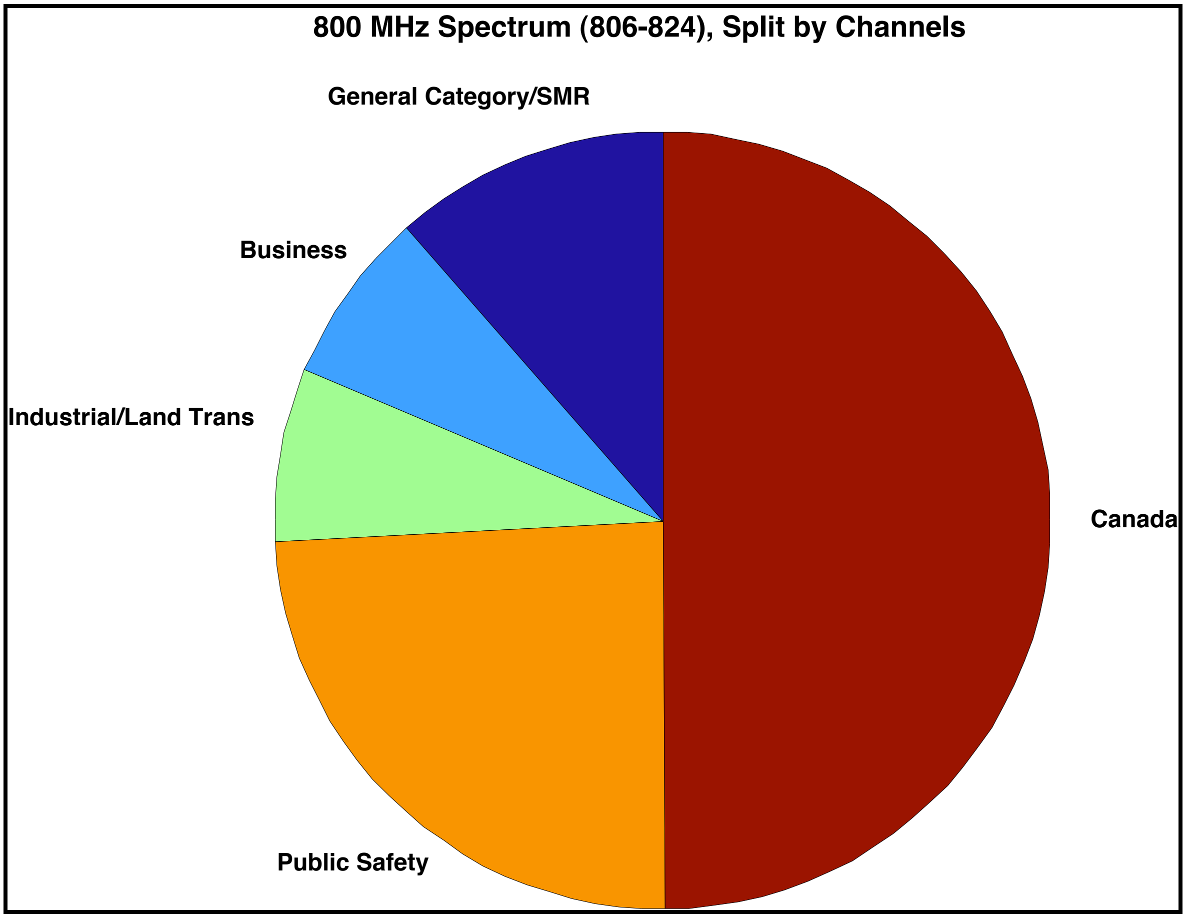


Figure B-3: US 800 MHz Band Plan, Canadian Regions I, IV, V, and VI, Split by Channels

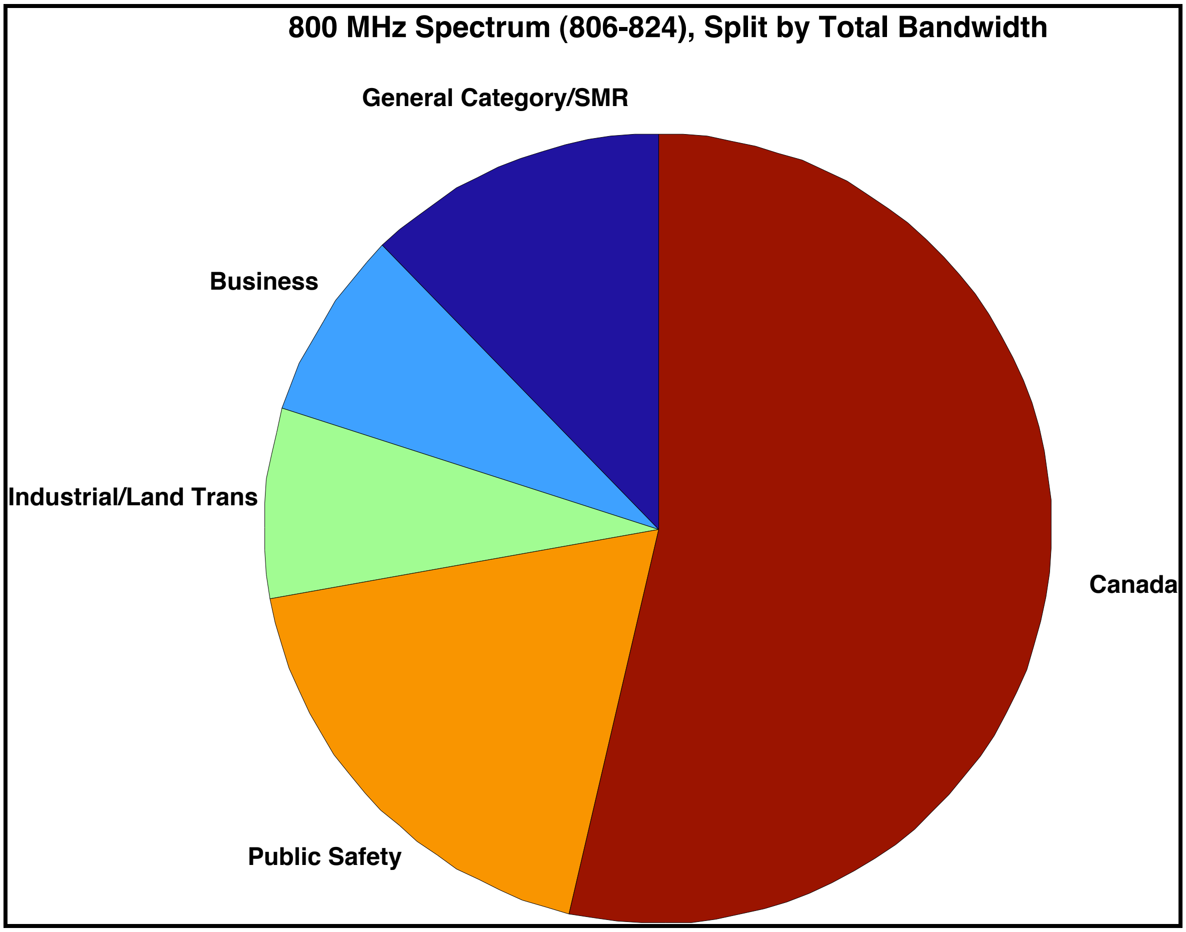


Figure B-4: US 800 MHz Band Plan, Canadian Regions I, IV, V, and VI, Split by Bandwidth

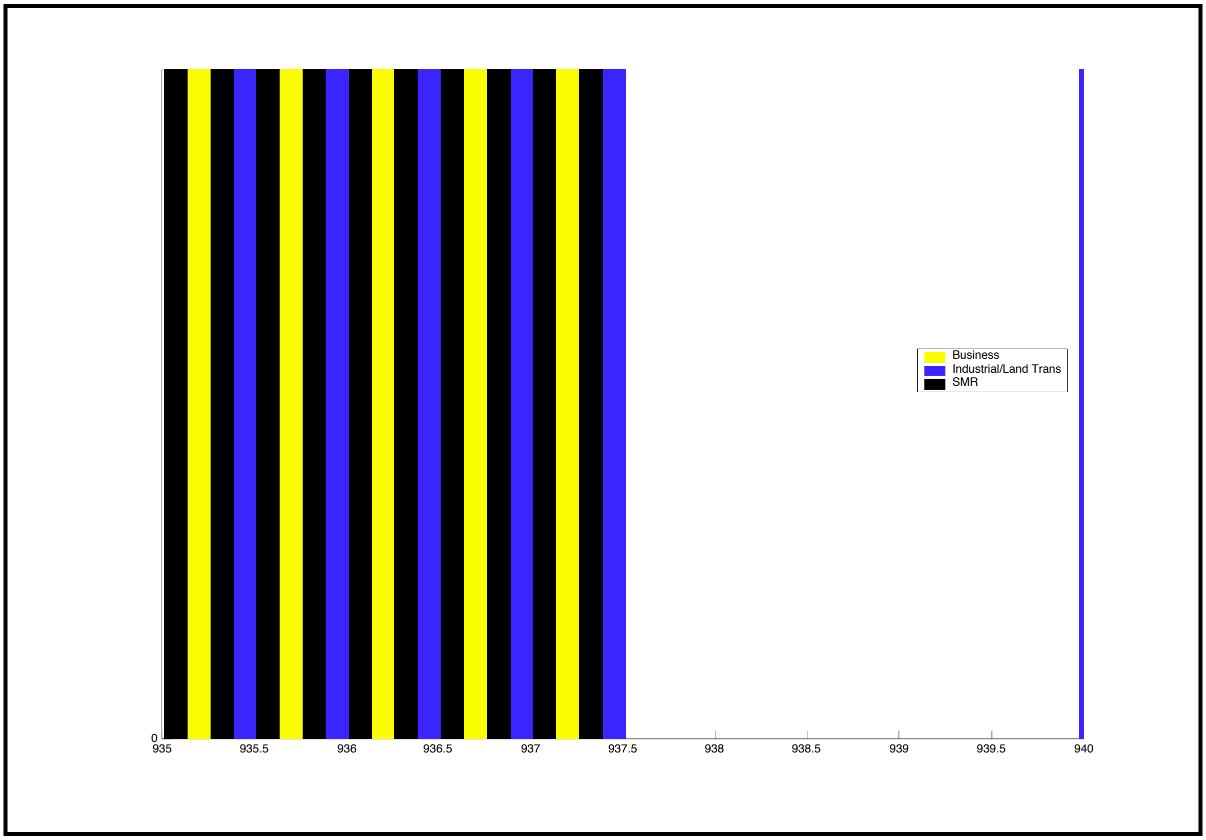


Figure B-5: US 900 MHz Band Plan, Canadian Regions I, IV, V, and VI

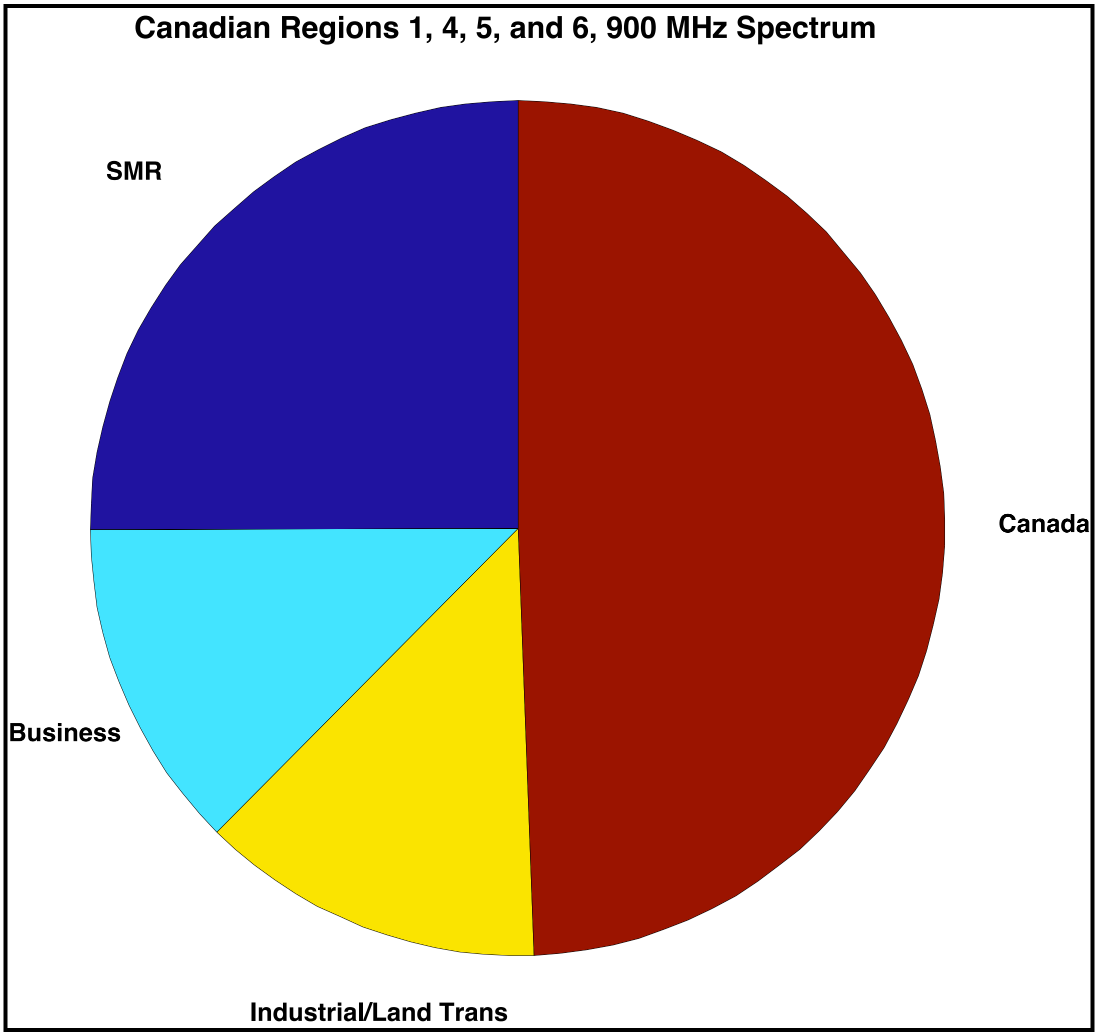


Figure B-6: US 900 MHz Band Plan, Canadian Regions I, IV, V, and VI, Split by Bandwidth

C. 800 AND 900 MHz BAND PLANS - CANADIAN BORDER REGION II

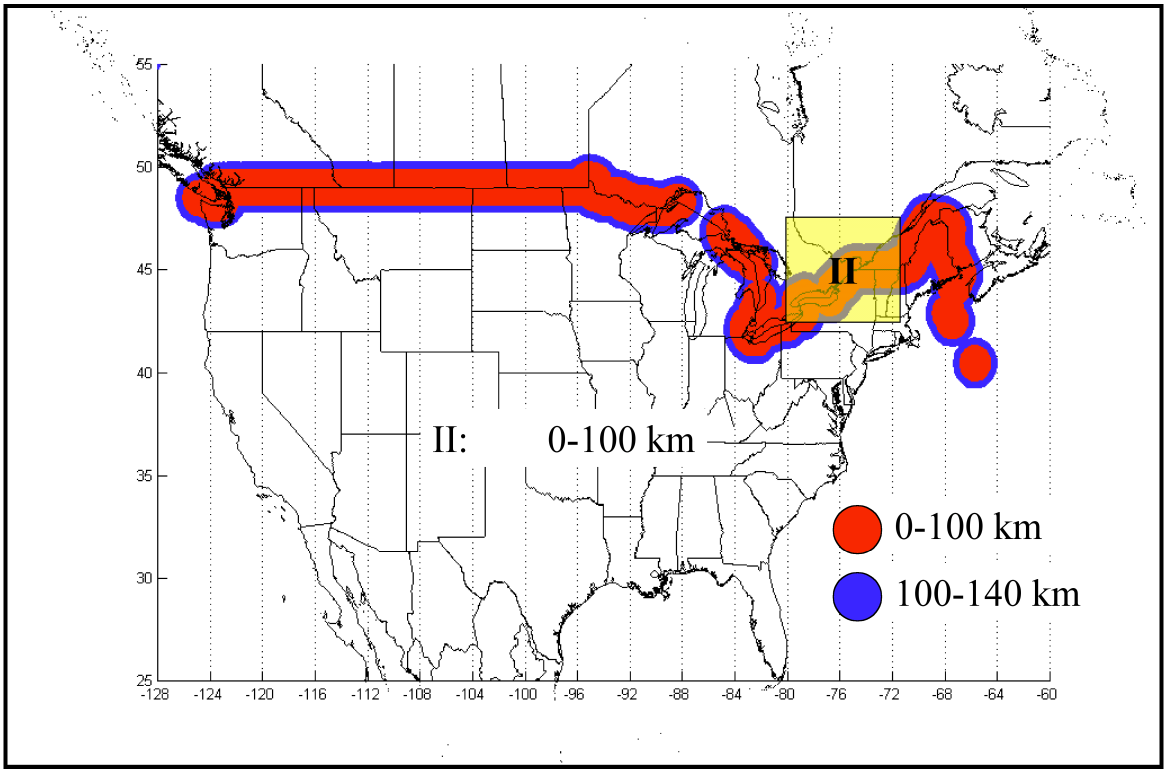


Figure C-1: Canadian Region II

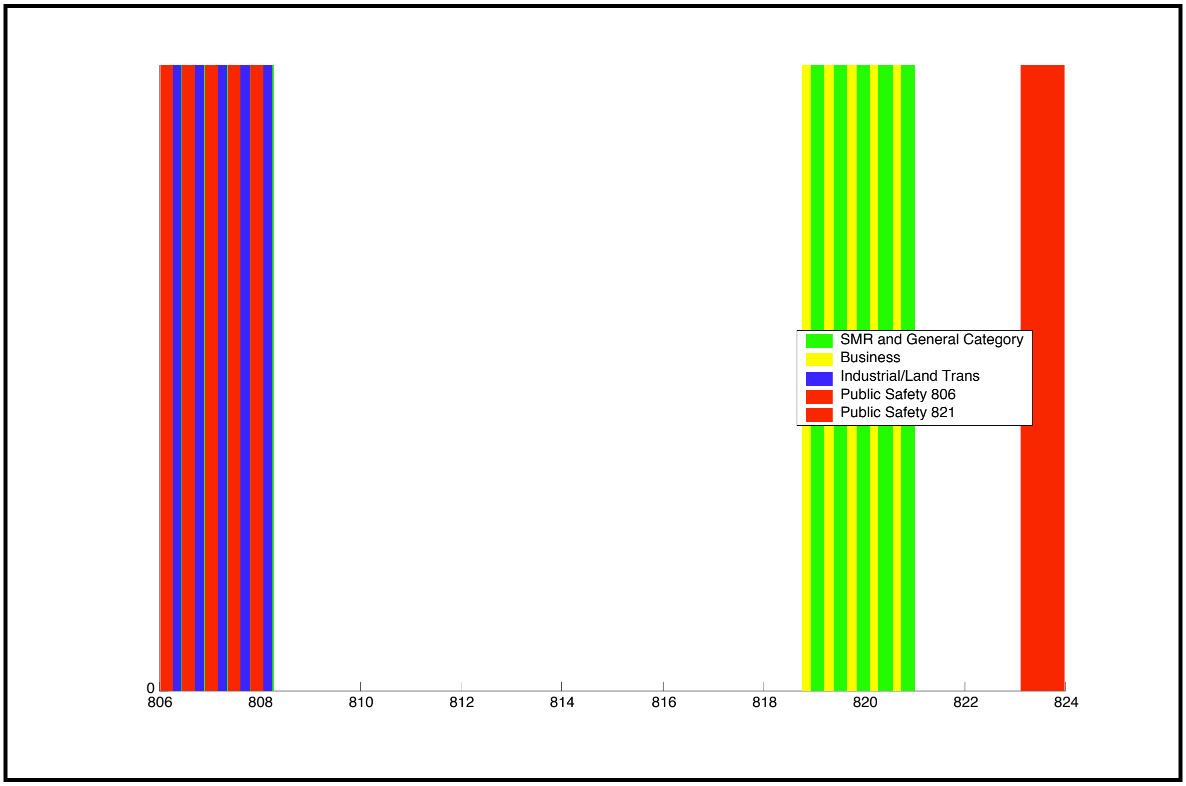


Figure C-2: US 800 MHz Band Plan, Canadian Region II

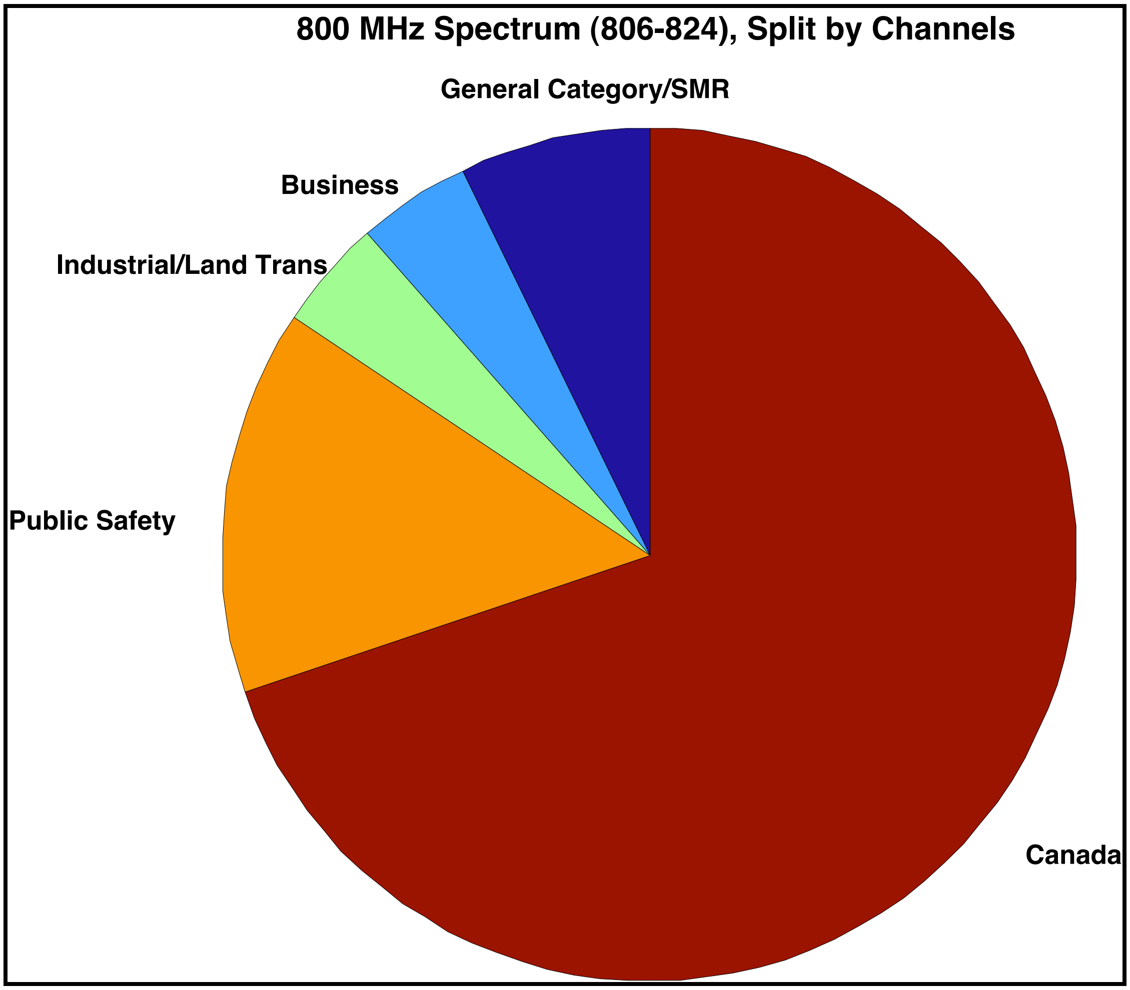


Figure C-3: US 800 MHz Band Plan, Canadian Region II, Split by Channels

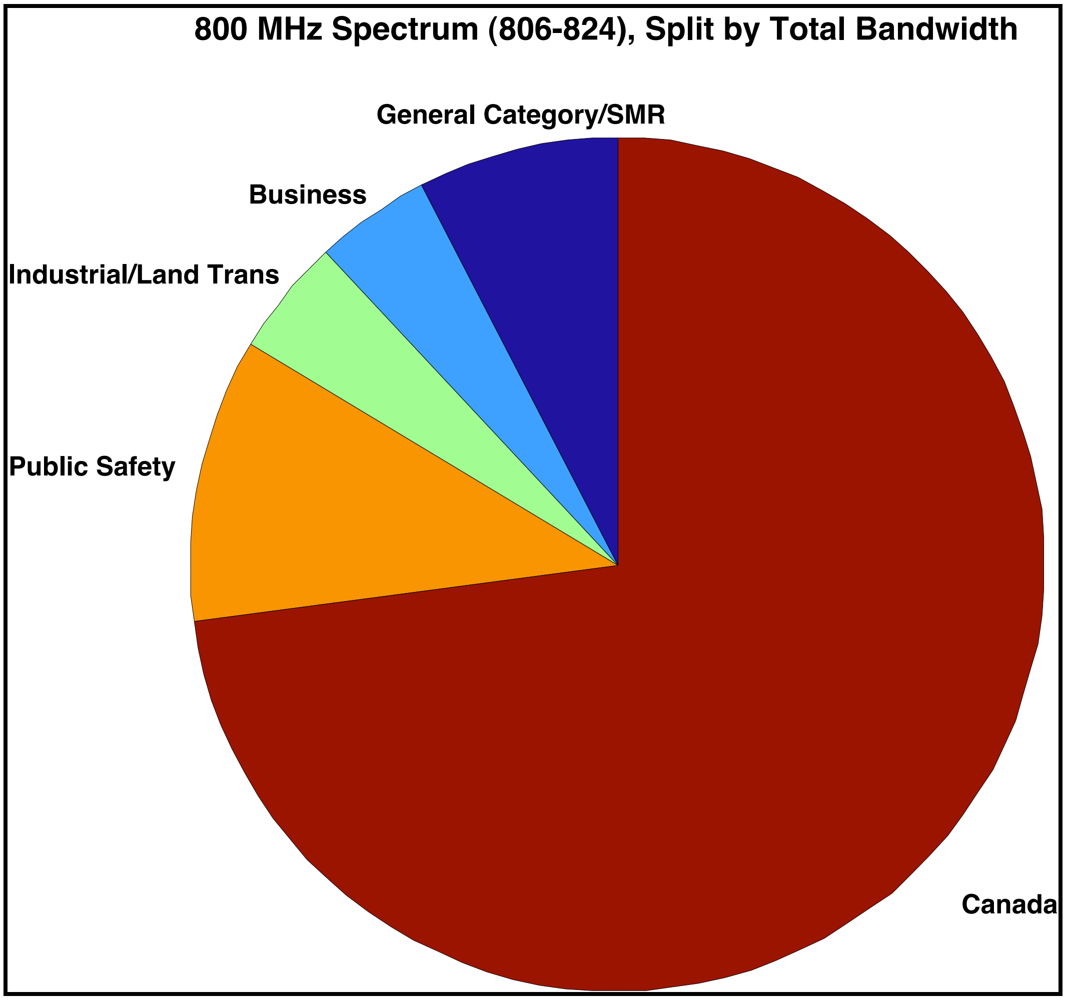


Figure C-4: US 800 MHz Band Plan, Canadian II, Split by Bandwidth

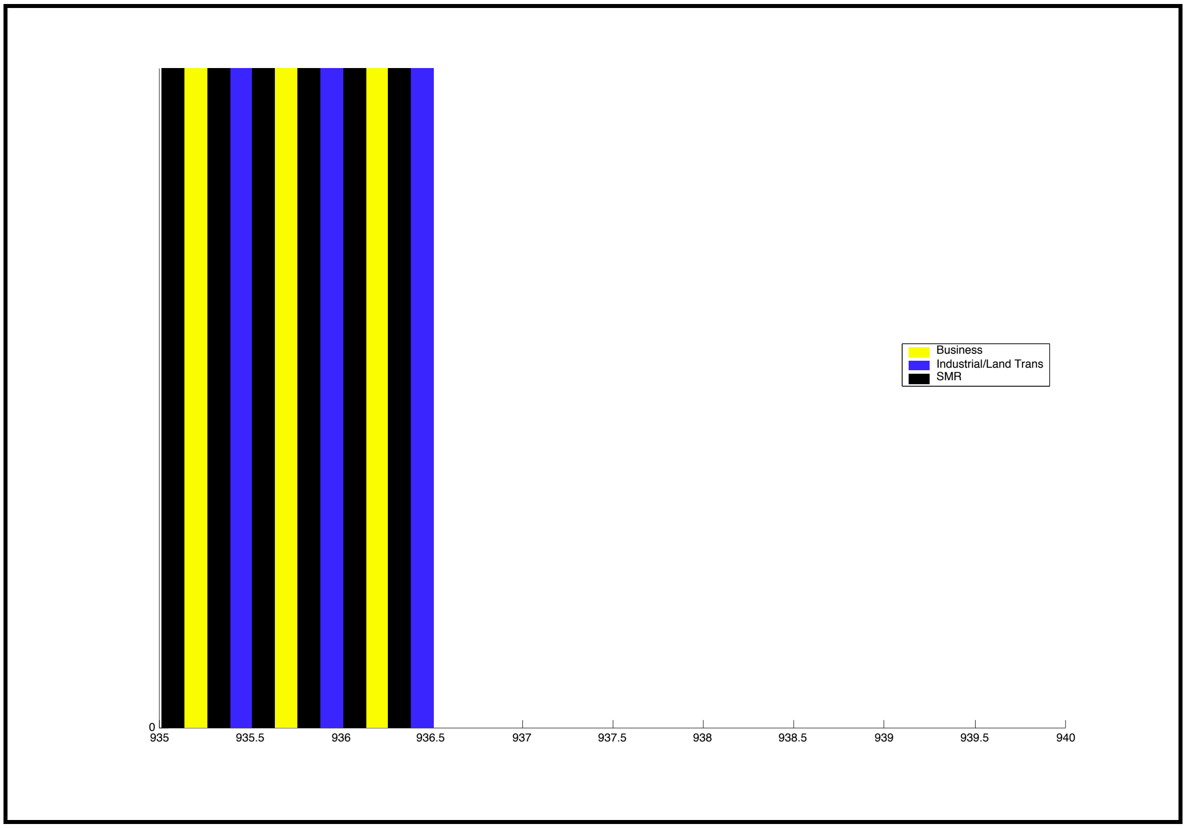


Figure C-5: US 900 MHz Band Plan, Canadian Region II

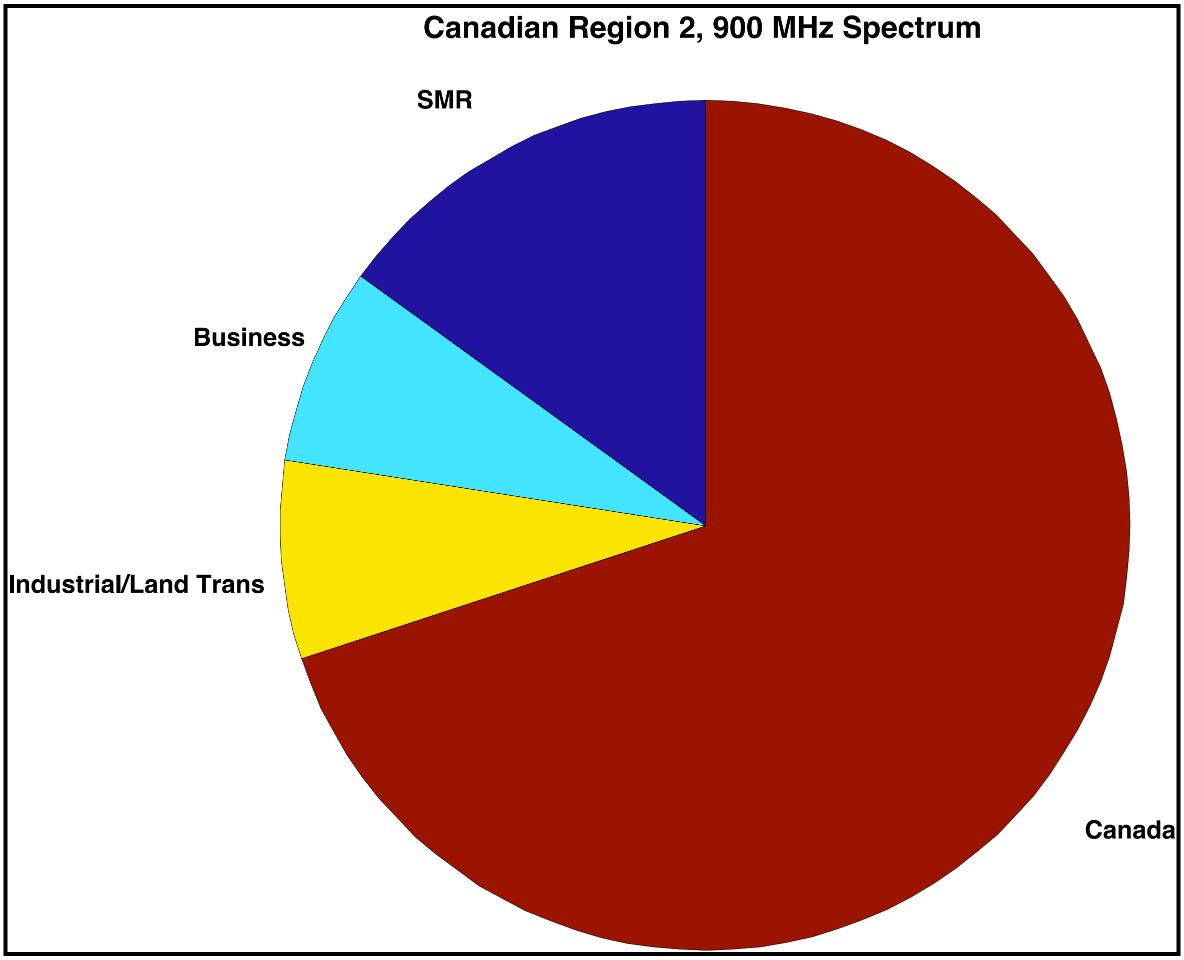


Figure C-6: US 900 MHz Band Plan, Canadian Region II, Split by Bandwidth

D. 800 AND 900 MHZ BAND PLANS - CANADIAN BORDER REGION III

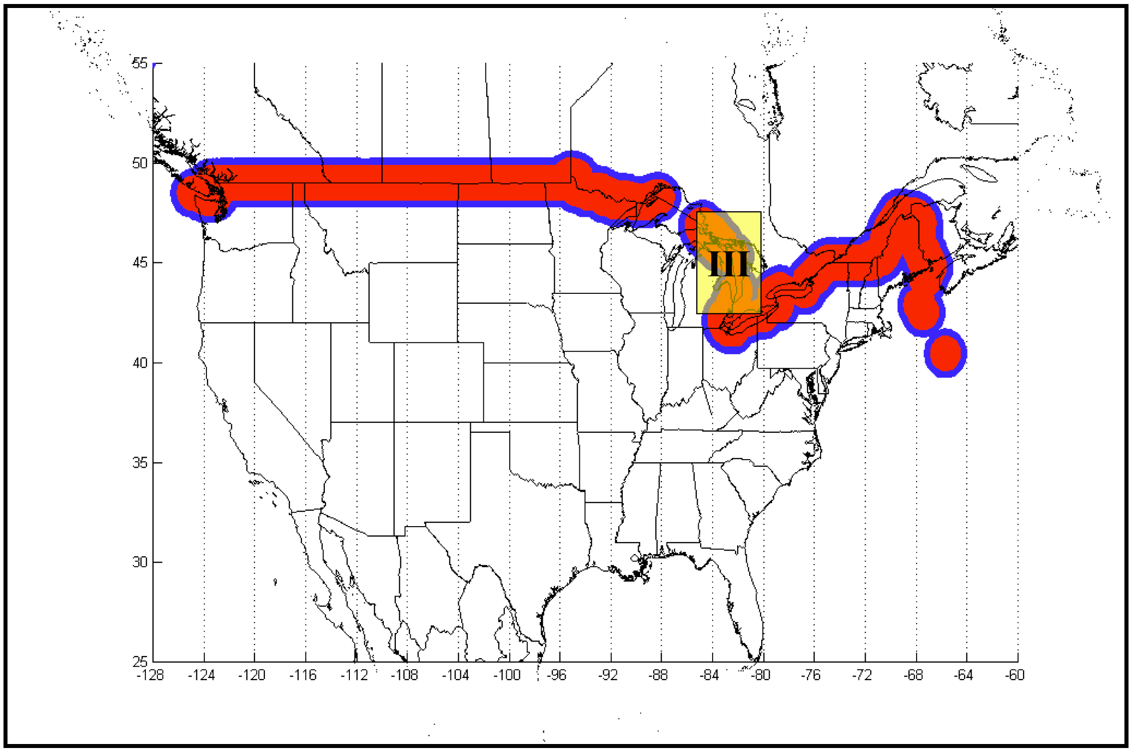


Figure D-1: Canadian Region III

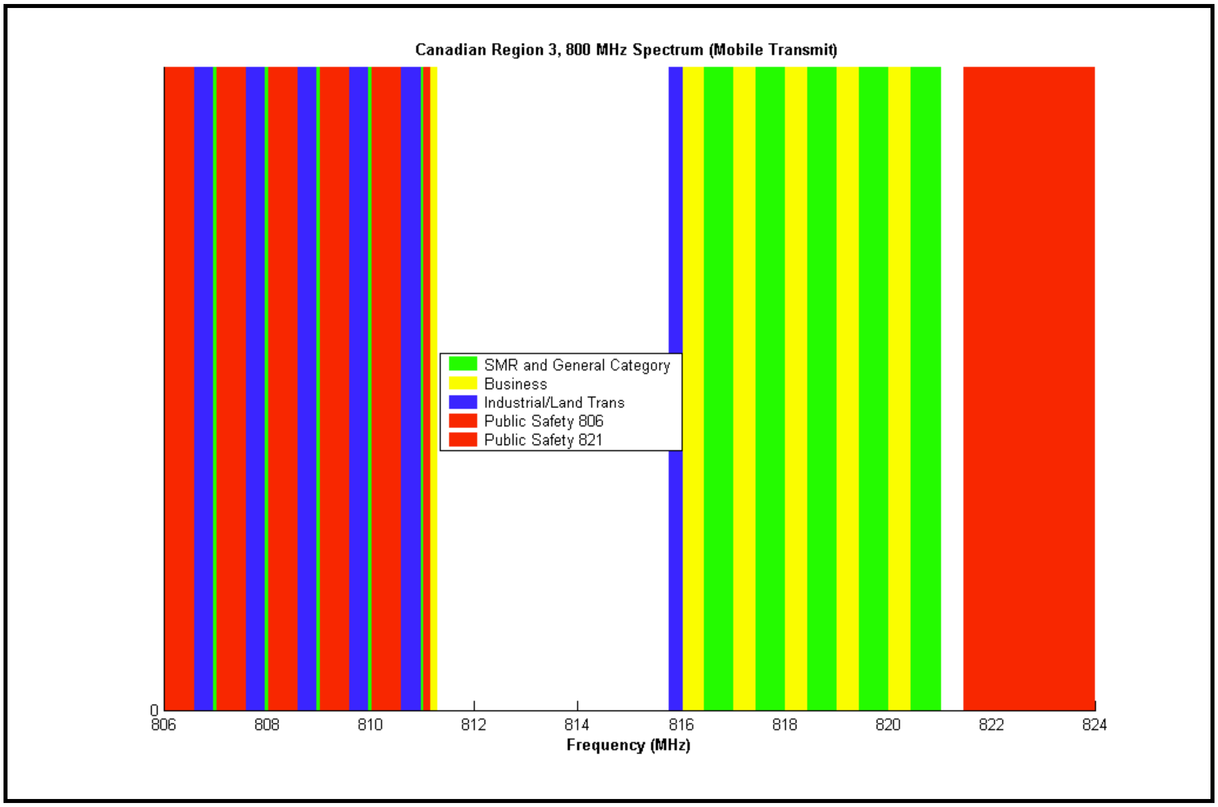


Figure D-2: US 800 MHz Band Plan, Canadian Region III

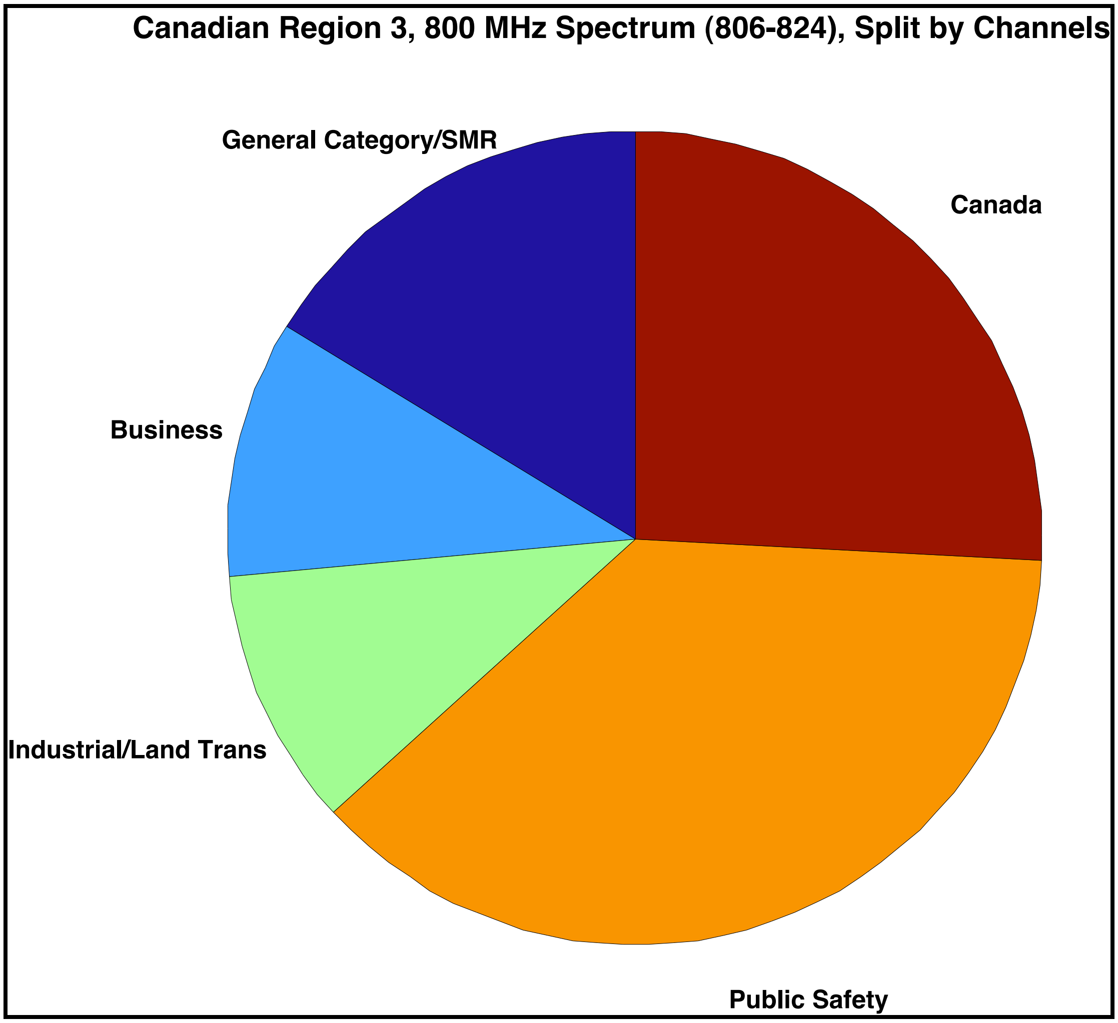


Figure D-3: US 800 MHz Band Plan, Canadian Region III, Split by Channels

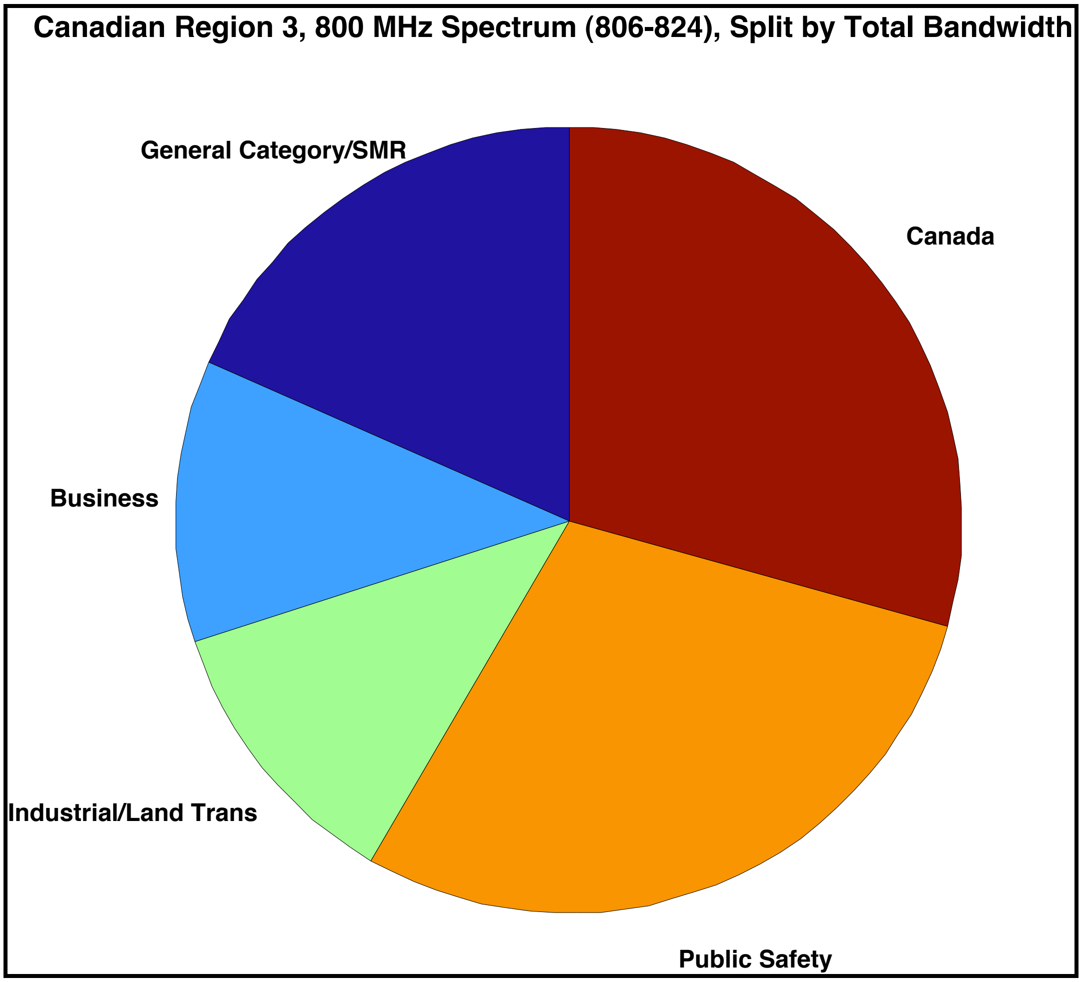


Figure D-4: US 800 MHz Band Plan, Canadian Region III, Split by Bandwidth

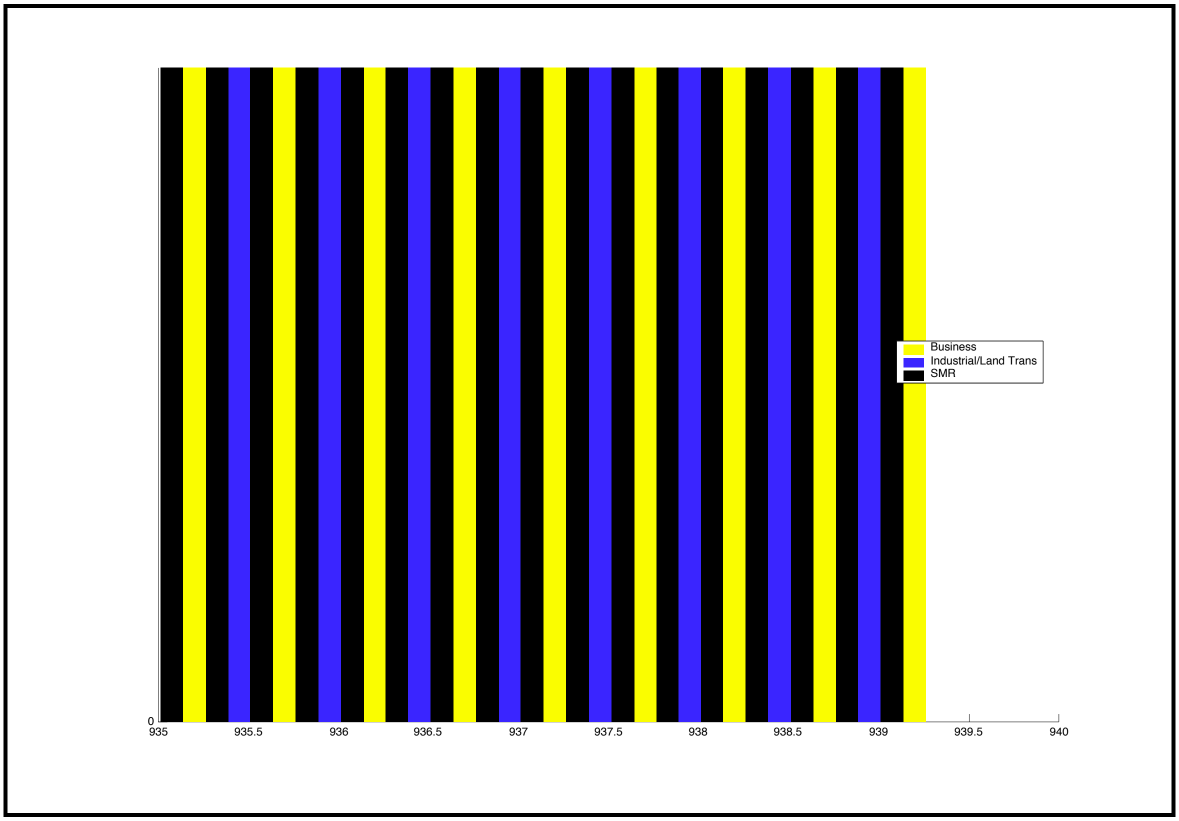


Figure D-5: US 900 MHz Band Plan, Canadian Region III

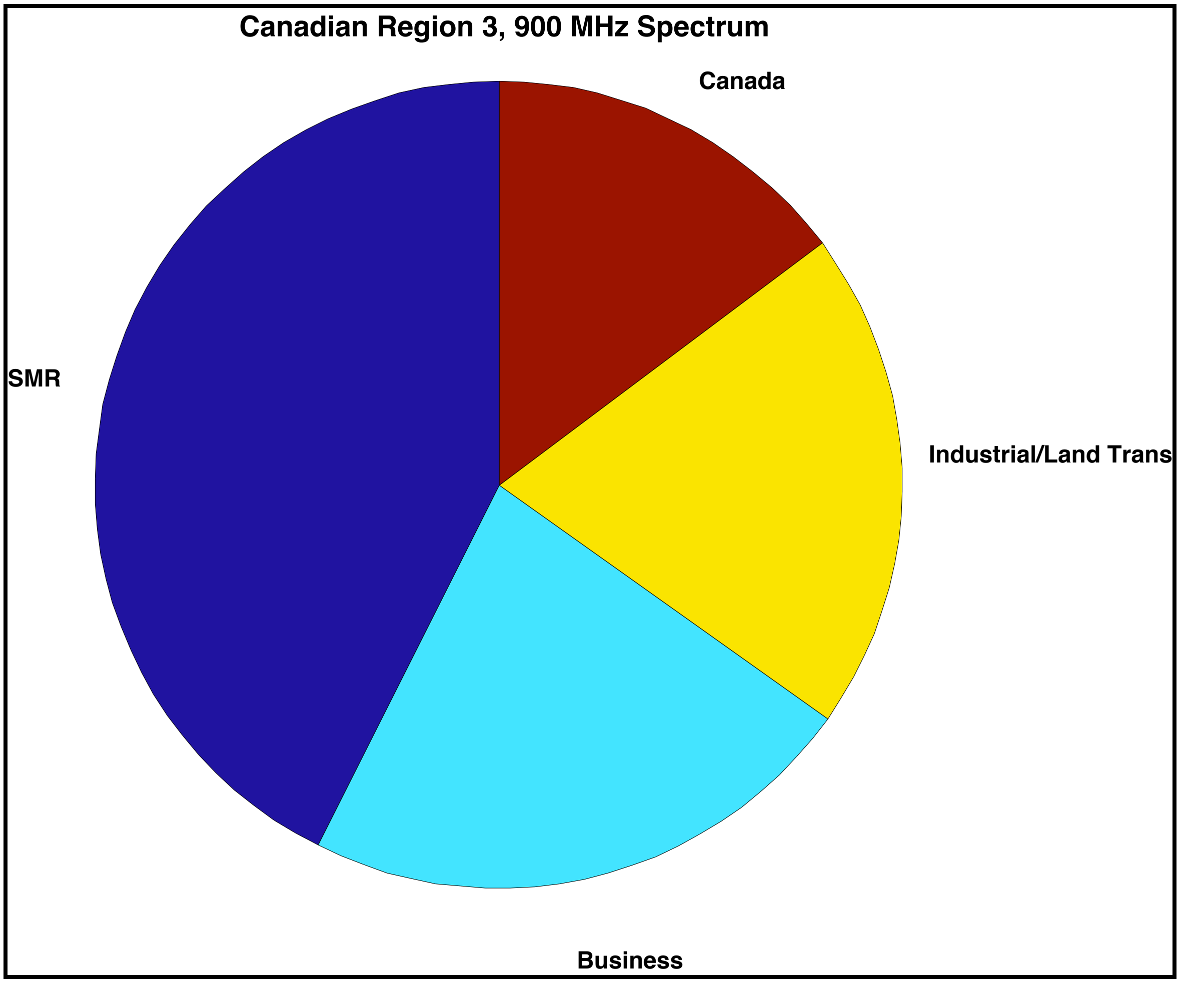


Figure D-6: US 900 MHz Band Plan, Canadian Region III, Split by Bandwidth

E. 800 MHz Band Plans - Canadian Border Regions VII and VIII

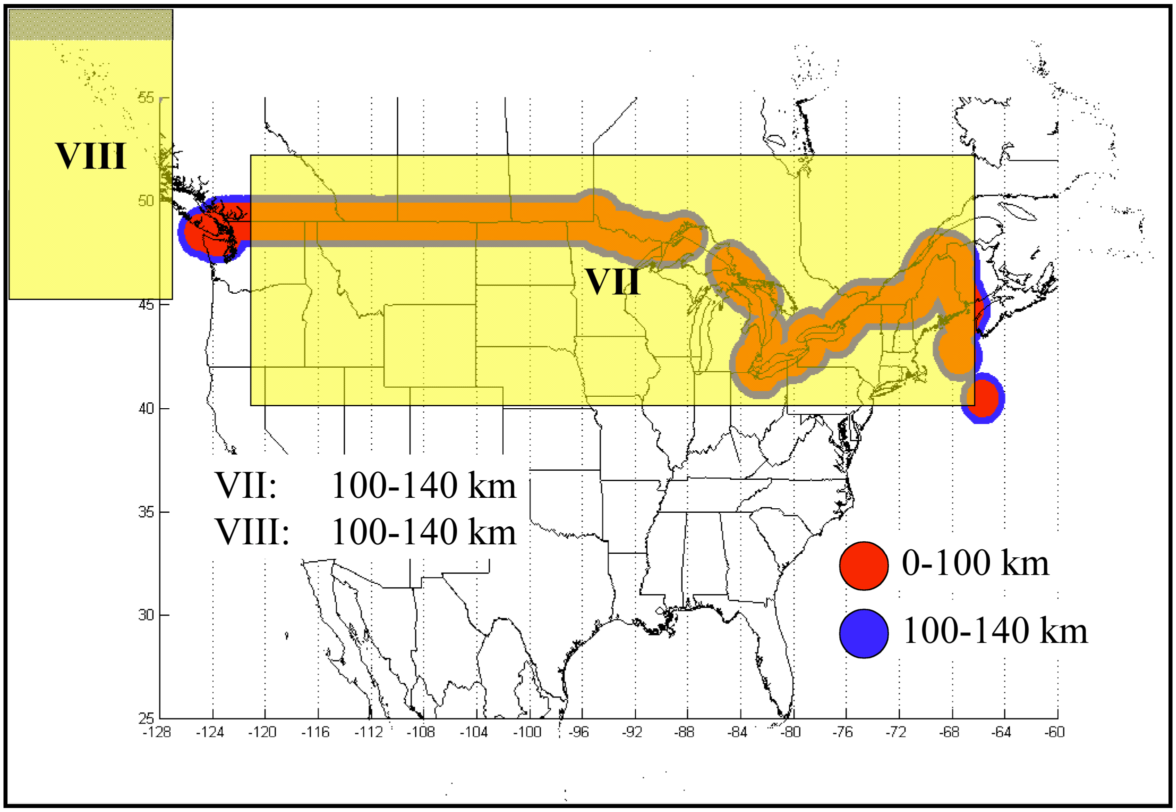


Figure E-1, Canadian Regions VII and VIII

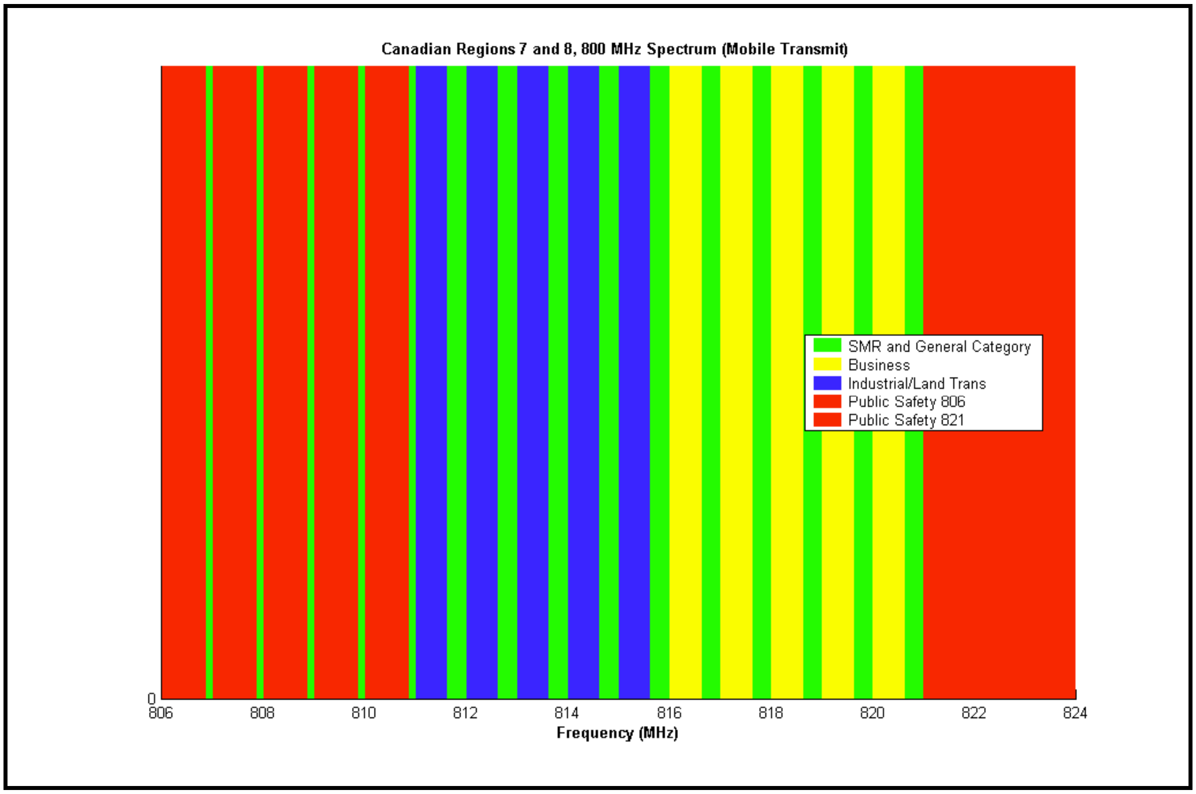


Figure E-2: US 800 MHz Band Plan, Canadian Regions VII and VIII

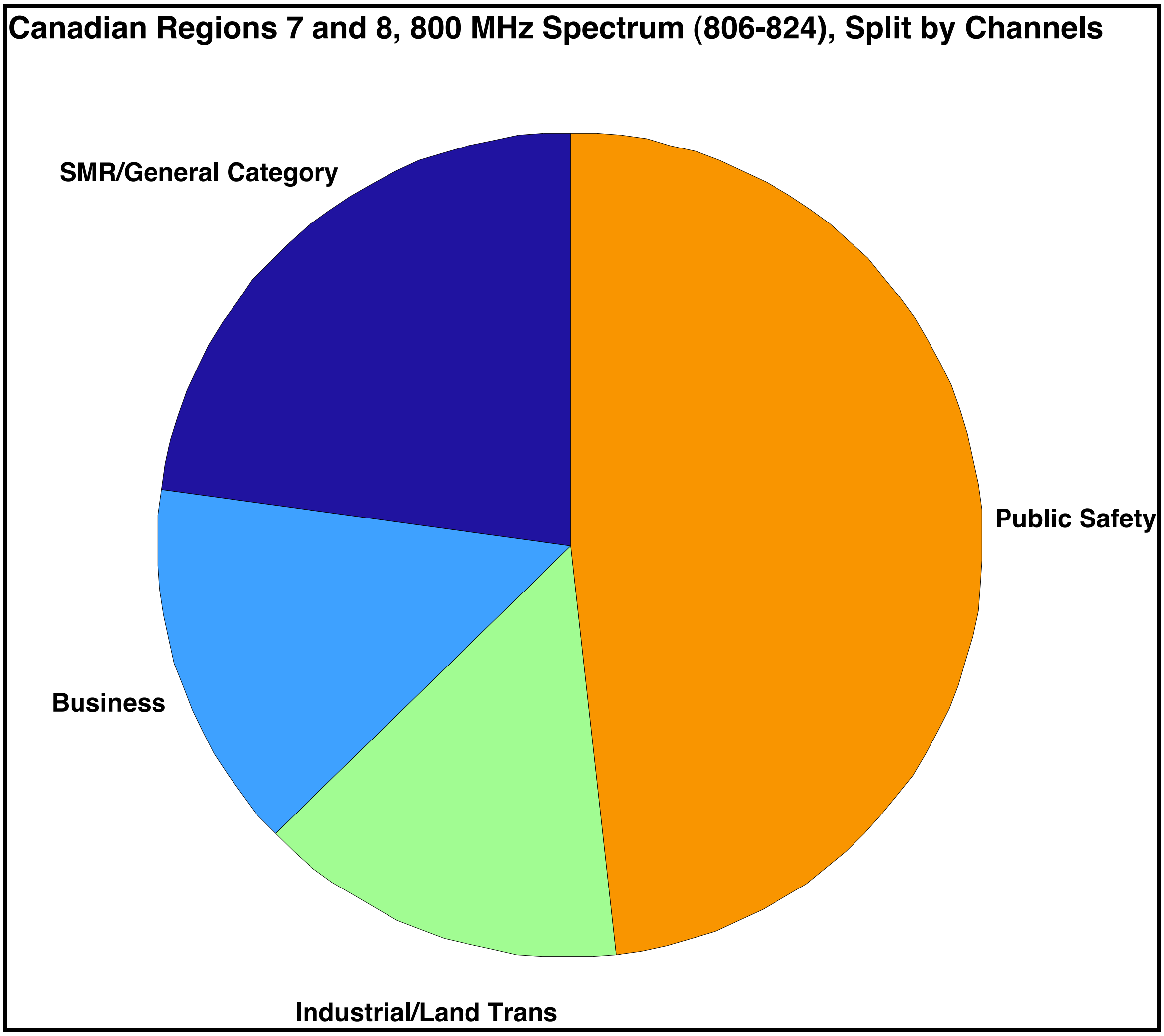


Figure E-3: US 800 MHz Band Plan, Canadian Regions VII and VIII, Split by Channels

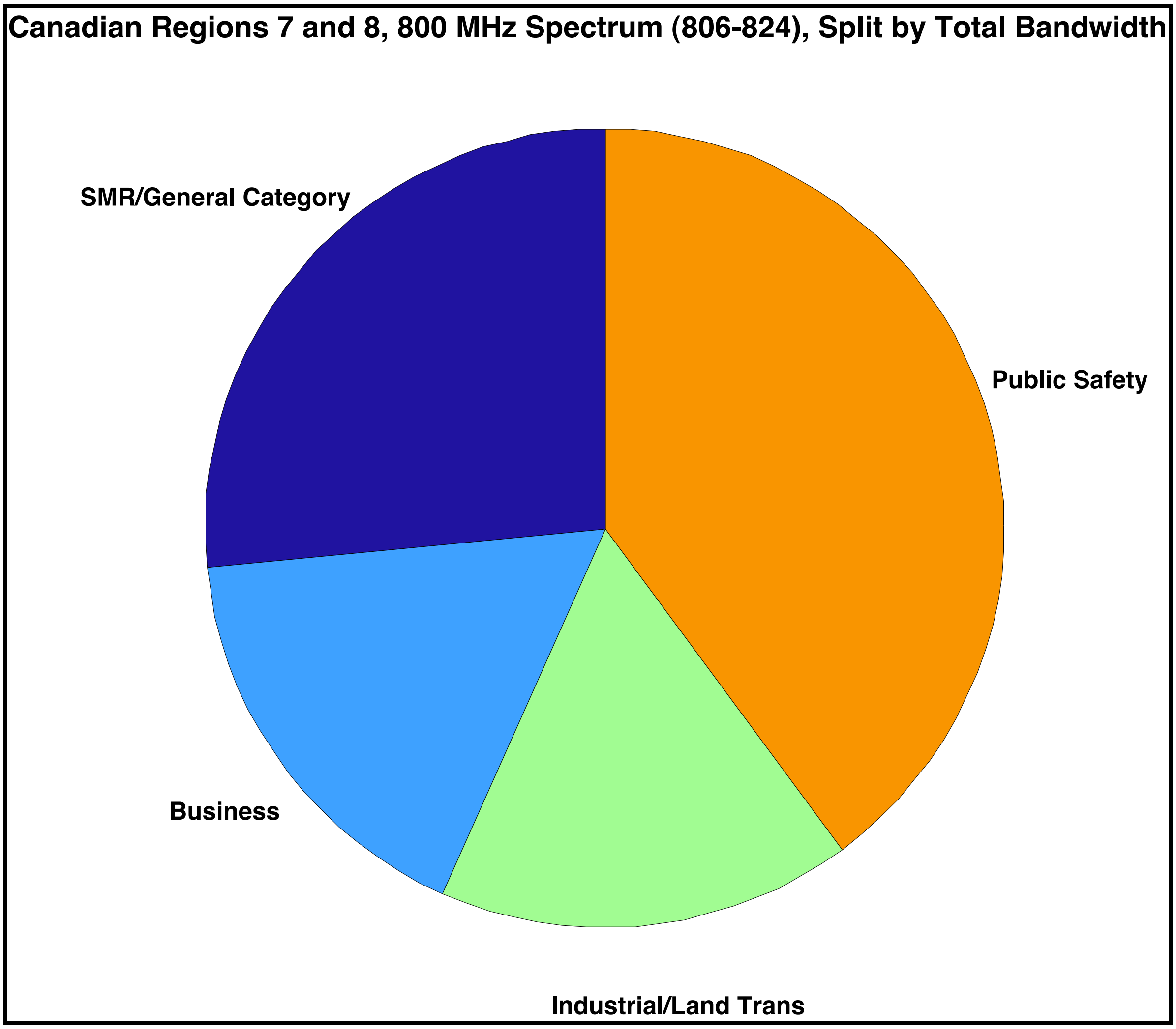


Figure E-4: US 800 MHz Band Plan, Canadian Regions VII and VIII, Split by Bandwidth

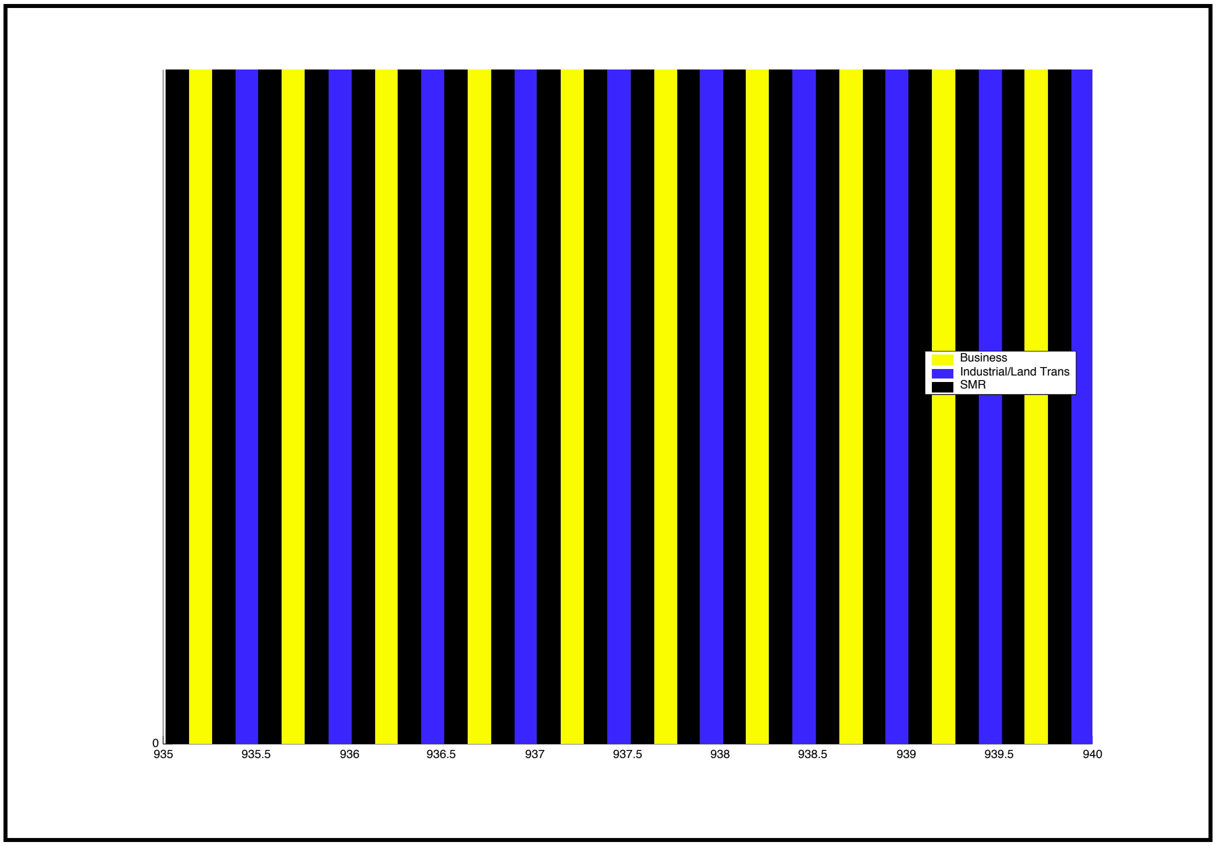


Figure E-5: US 900 MHz Band Plan, Canadian Regions VII and VIII

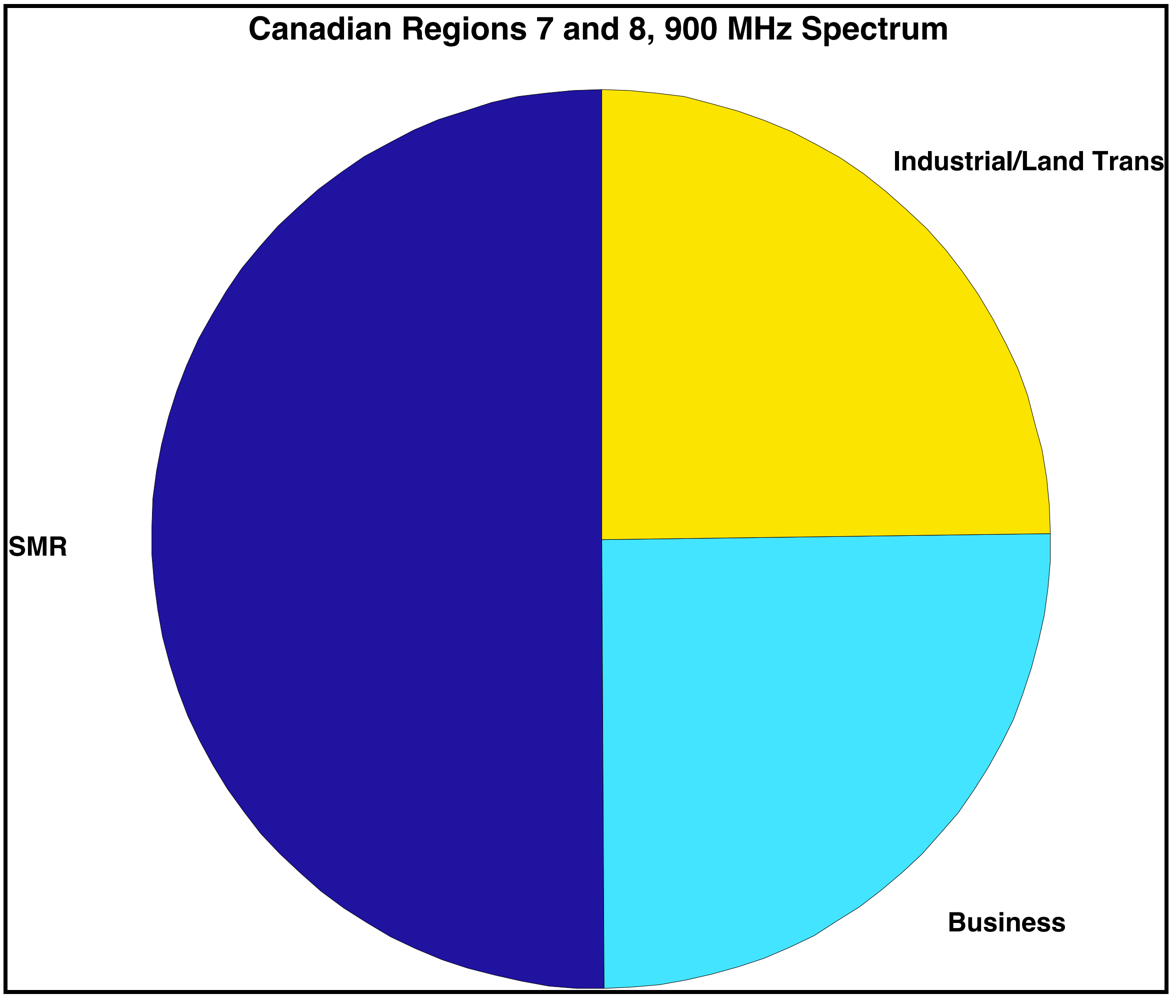


Figure E-6: US 900 MHz Band Plan, Canadian VII and VIII, Split by Bandwidth

F. PRESENTATION: 700 MHZ TELEVISION EFFECTS ON PUBLIC SAFETY

The following is material generated to document an investigation into the effects that only a few of the Canadian Digital television allotments would have on 700 MHz availability in Michigan and Ohio — both of which are currently constructing Statewide systems that will play a critical role in border security and homeland defense. These slides will clearly show that 700 MHz will not be available over large areas of both states until the Canadian Digital Television (DTV) Transition is fully completed. This DTV transition has yet to be defined, and therefore may not be completed for 10-15 years.

Approximate Impact Range of Dominant-Effect Canadian 700 MHz Stations

- with Focus on Impacts to Ohio and Michigan

Dominant Stations

- Television Channels 68 and 69 radiate directly into 700 MHz receivers, well above ground level (~150 ft)
- DTV 68 and 69 in Windsor are seen to cause the largest concern within the area.
  - They have the greatest impact
- Note that although adjacent-channel effects are shown here, the practical problem is co-channel
  - With 68 and 69 used, there is nowhere left to go within the allocation

Propagation Model

- No terrain data was available for Canada using our usual modeling tools, therefore an Okumura-Open model with diffraction losses was used
  - Knife-edge diffraction with losses considered over all primary blocking obstacles
- For LMR receivers at ~150'AGL, this model essentially parallels free space propagation – up to the point of terrain/diffraction losses/shadowing

Links

TV Station

- 80-83 dBm (NTSC ERP_{pk})
- -27 dB (into LMR ENBW
- +10 dB (LMR antenna gain)
- -12 dB (LMR Cross Polarization Loss)
- -12 dB (Peak NTSC to average DTV ERP)
- **Model ERP of ~16W (42 dBm)**

LMR Sensitivity

- -134 dBm (kTB at ENBW)
- + 10 dB (LMR Noise Figure)
- + 4 dB (assorted losses)
- **Model sensitivity of -120 dBm for co-channel case**
- **Model sensitivity of -75 dBm for adjacent-channel case (with 45 dB ACCPR)**

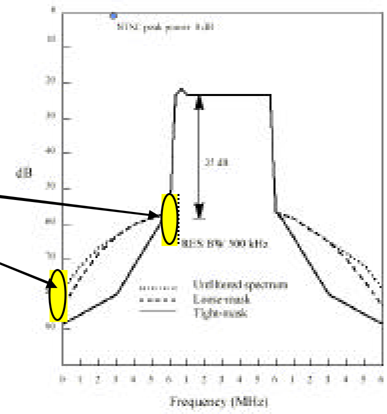
An interference-limited LMR design will reduce the effects of the television interference, but will require many more sites to provide system coverage.

DTV Adjacent Channel Power

Note that the noise levels at the sidebands of unfiltered DTV spectrum fall approximately -35 dB down at the near-edge of the band,

to -55 dB down at the far-edge.

These levels will be considered for the adjacent-channel cases.

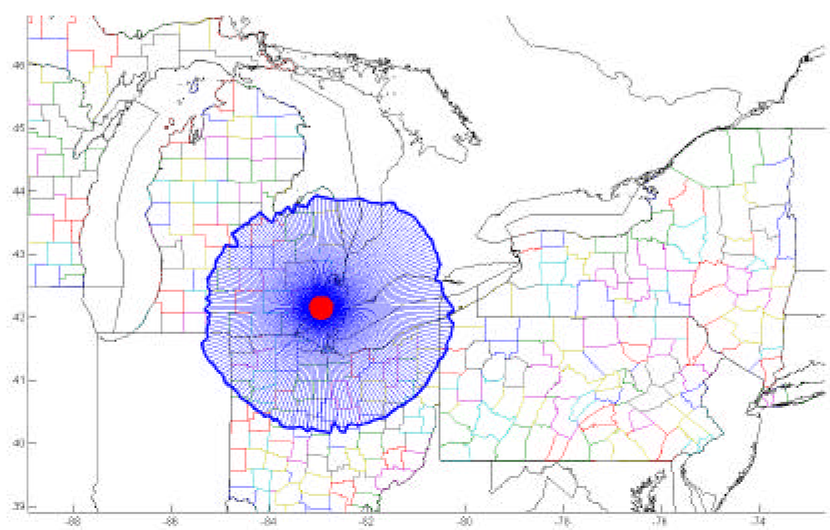


Ref: Figure 5: Proposed emission masks, Appendix 3, DIGITAL TELEVISION, Service Considerations and Allotment Principles, Prepared by, JTCAB Ad Hoc Group on DTV Planning Parameters, August 1997

(Average DTV ERP Label Removed for Clarity, power measured in 500 kHz Res. BW

Canadian TV/DTV Interference Range

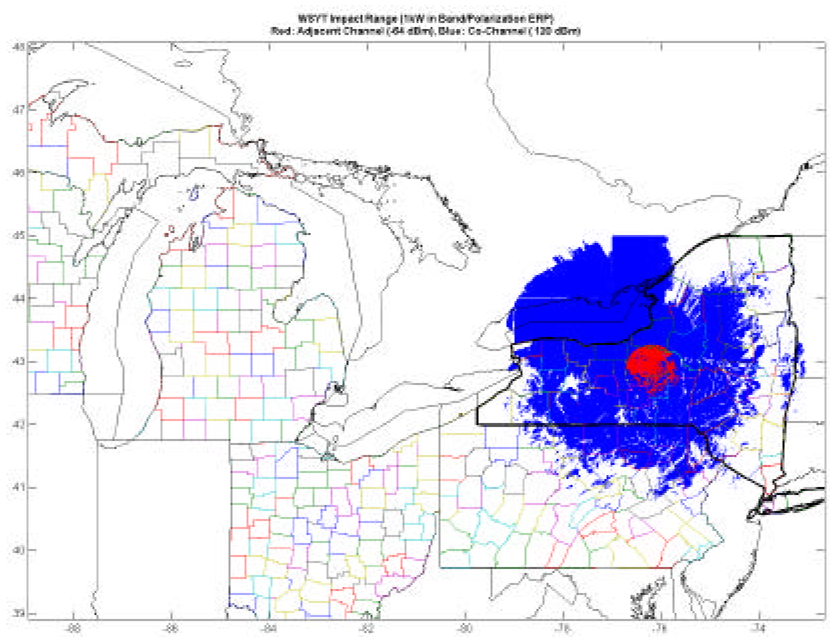
Approximate Range of Co-Channel (Blue) and Adjacent-Channel (Red) Effects At LMR Receivers (150')
Windsor Stations Channels 68 and 69



Is this Realistic?

- Compare the effects previously presented to effects from a detailed propagation model
  - 3-second, LULC, using multiple diffraction losses
  - See next slide showing a New York station
- Note that the effects spread very far from the station, despite:
  - The detailed study only went out **255 km** in range
  - New York's Terrain is **much** more rugged than Ohio’s
  - The receiver height portrayed is only at **30 feet**
- Considering this, the impact ranges previously presented seem realistic
  - In fact, with circular polarization on the DTV transmitters, the XPOL would be closer to 3-6 dB, as opposed to 12 dB

TV Interference Range (TV-68)

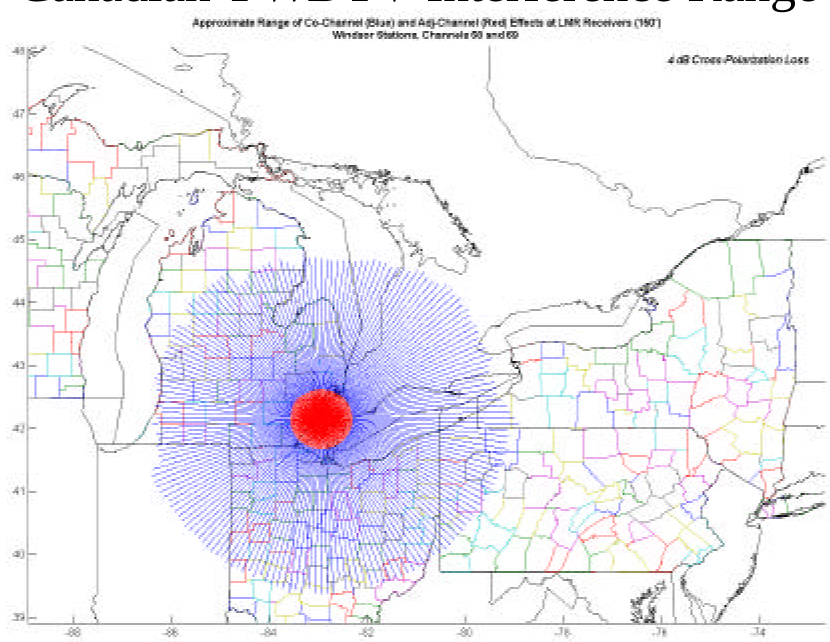


What if the Canadian DTV <u>is</u> Circularly/Elliptically Polarized?

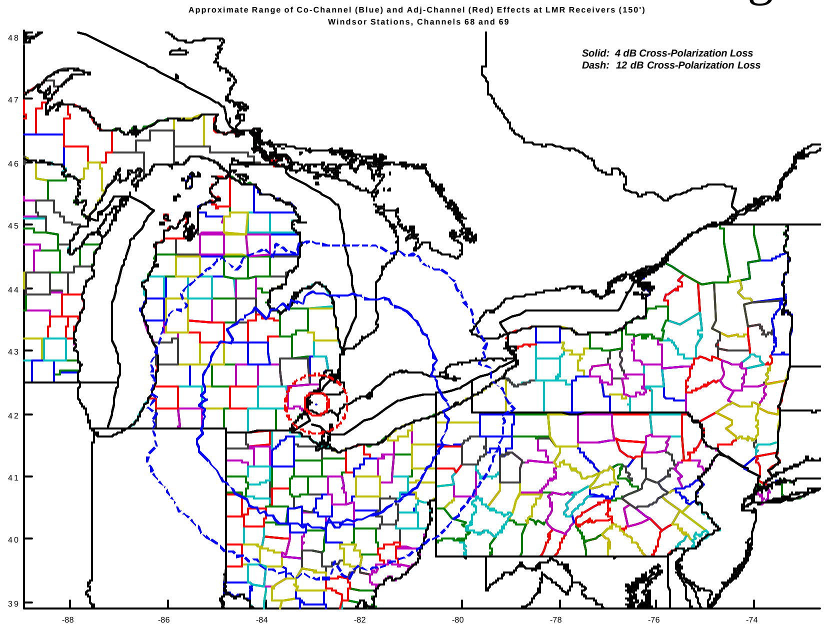
- Most DTV <u>is</u> CP/EP
- Impacts would be <u>much</u> greater (by 6-9 dB)

83 dBm (NTSC Peak ERP)
\- 27 dB (coupling into LMR ENBW)
\+ 10 dB (LMR antenna gain)
\- 4 dB (LMR Cross Polarization Loss)
\- <u>12 dB</u> (Peak NTSC to DTV ERP)
Model ERP of ~100W (50 dBm)

Canadian TV/DTV Interference Range



Canadian TV/DTV Interference Range



Summary of Impact Distances

(TV-68 and 69 to LMR Base Receivers)

Case	Average Impact Distance (km)
Co-Channel (XPOL=12 dB)	207 km / 128 miles
Co-Channel (XPOL=4 dB)	299 km / 186 miles
Adj-Channel (XPOL=12 dB)	20 km / 12 miles
Adj-Channel (XPOL=4 dB)	52 km / 32 miles

Note that the above impact distances are specific to this case, and are presented for illustrative purposes only. These distances can vary, and, in fact, impacts may be felt at much greater distances under certain circumstances.

G. 700 MHz - Availability in the Canadian Border Regions

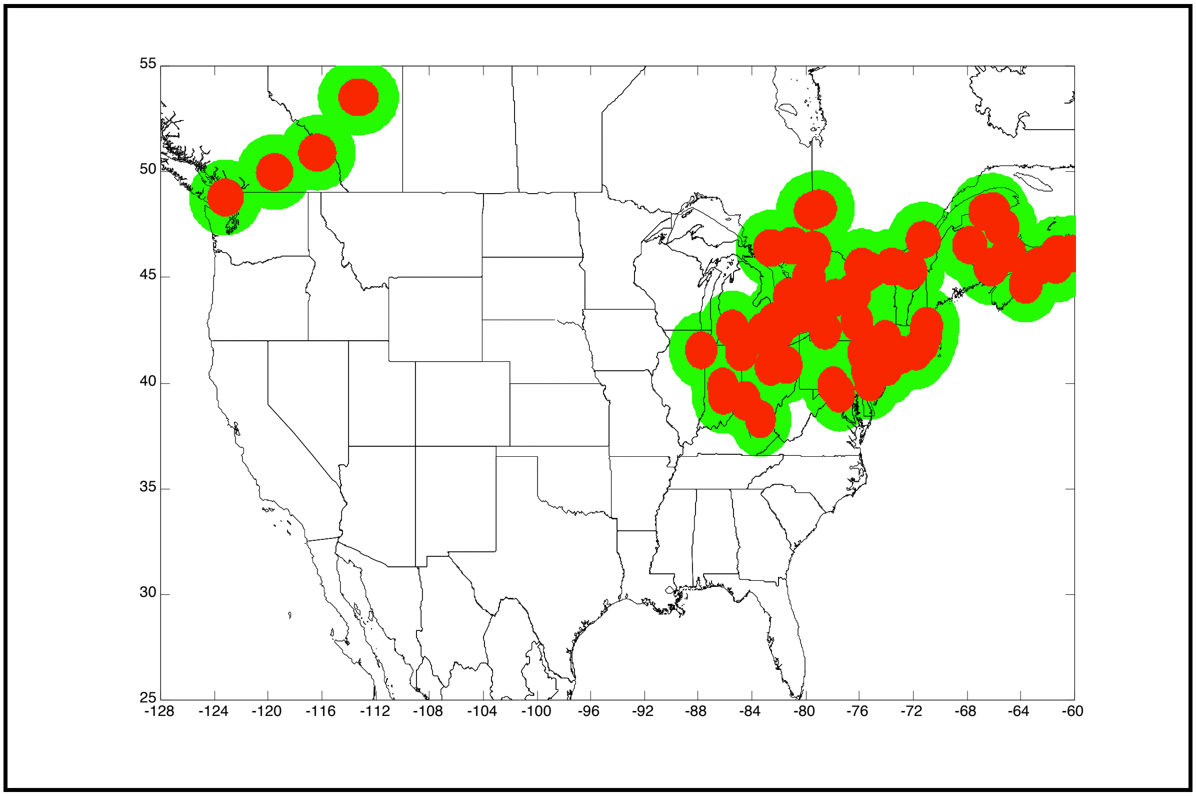


Figure G-1: TV/DTV Affecting Public Safety 700 MHz in the Canadian Border Regions

Figure G-1 portrays 100- and 200-km impact regions surrounding existing operational primary-class analog television stations, along with protected primary-class[1] Canadian 700 MHz digital television allotments.

[1] Class A, B, C, D, N. R. S, VL, or VU

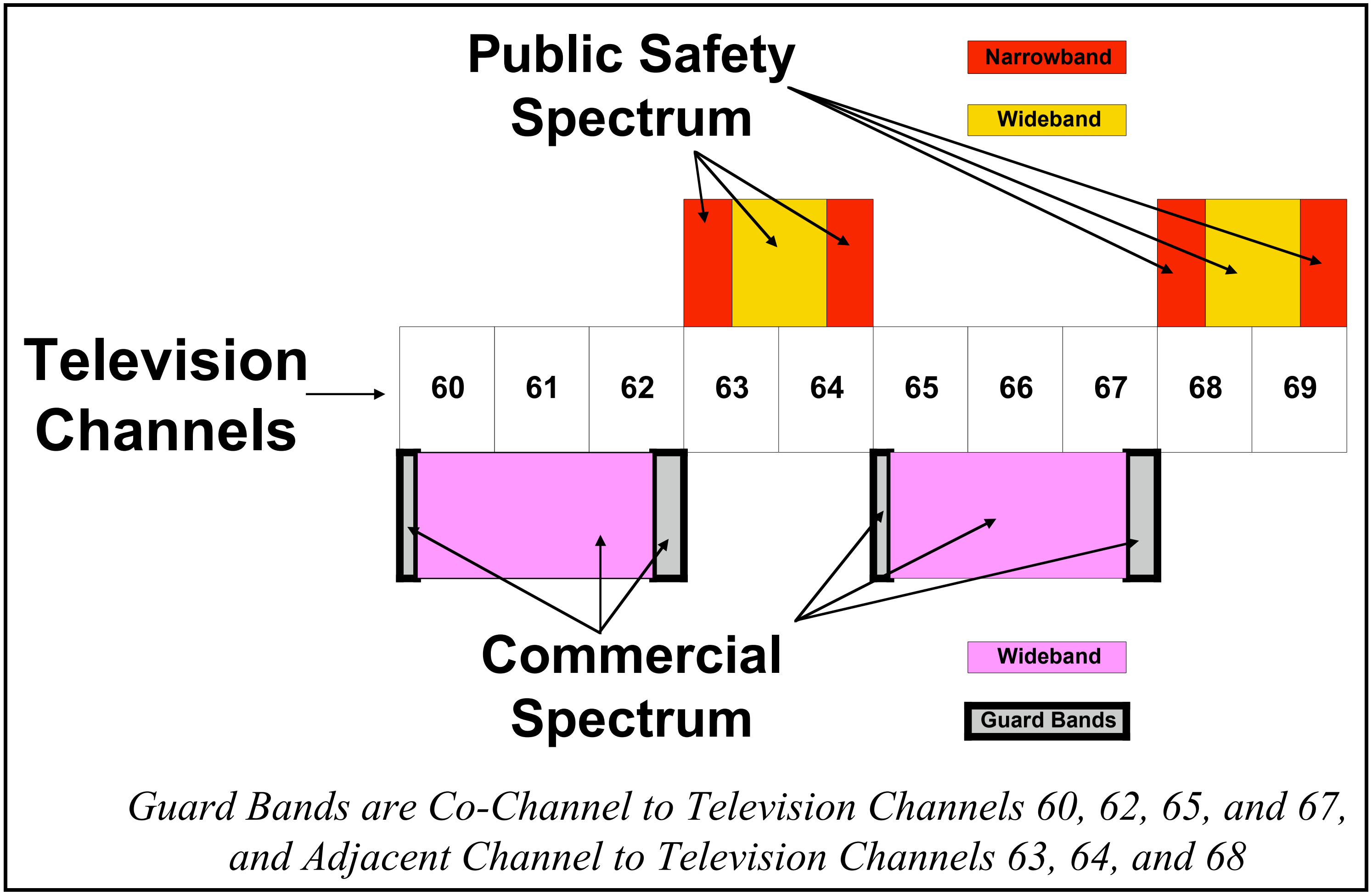


Figure G-2: The US 700 MHz Spectral Allocations

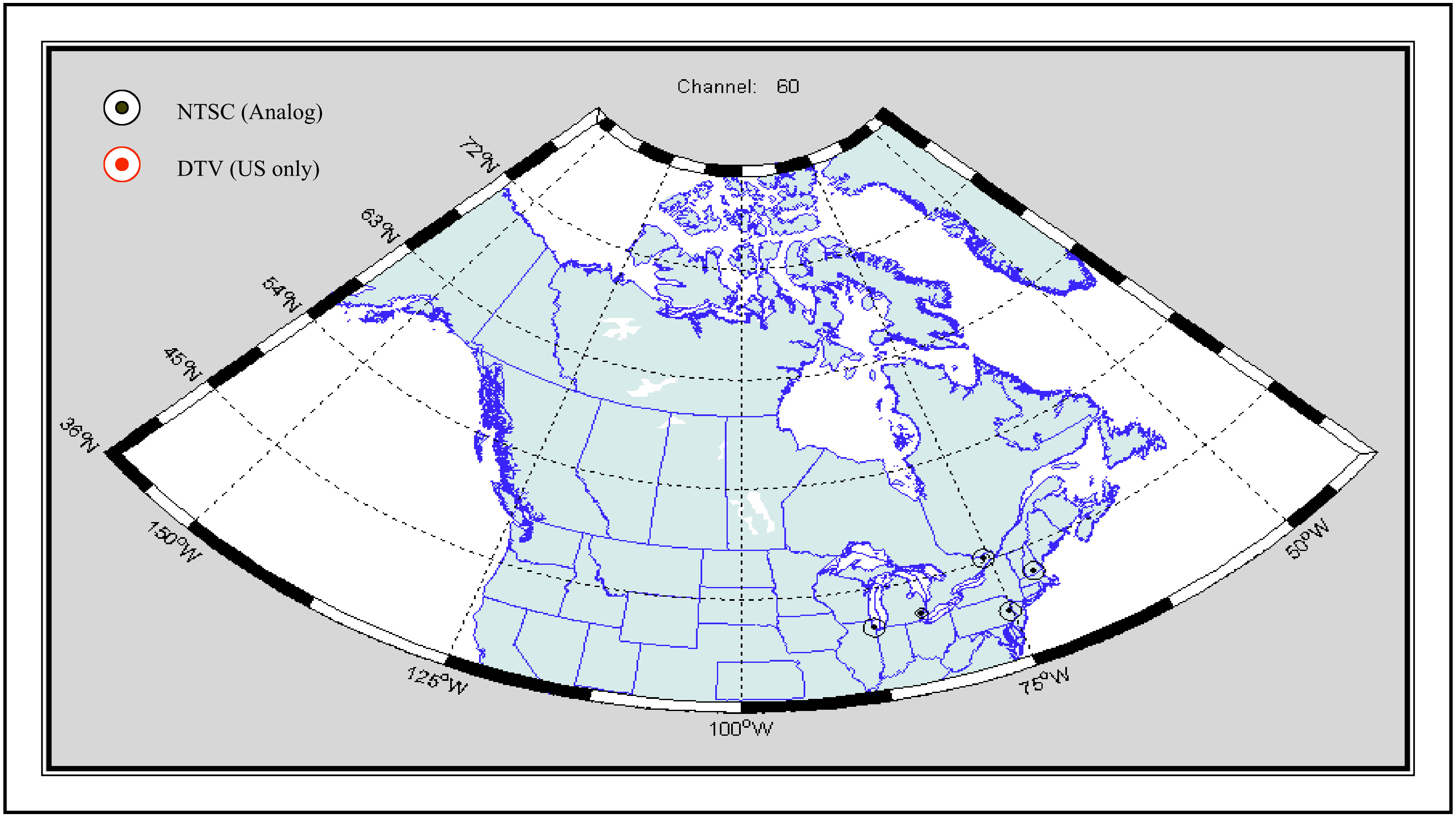


Figure G-3: US DTV, and Canadian Analog TV Affecting Guard Bands - Channel 60

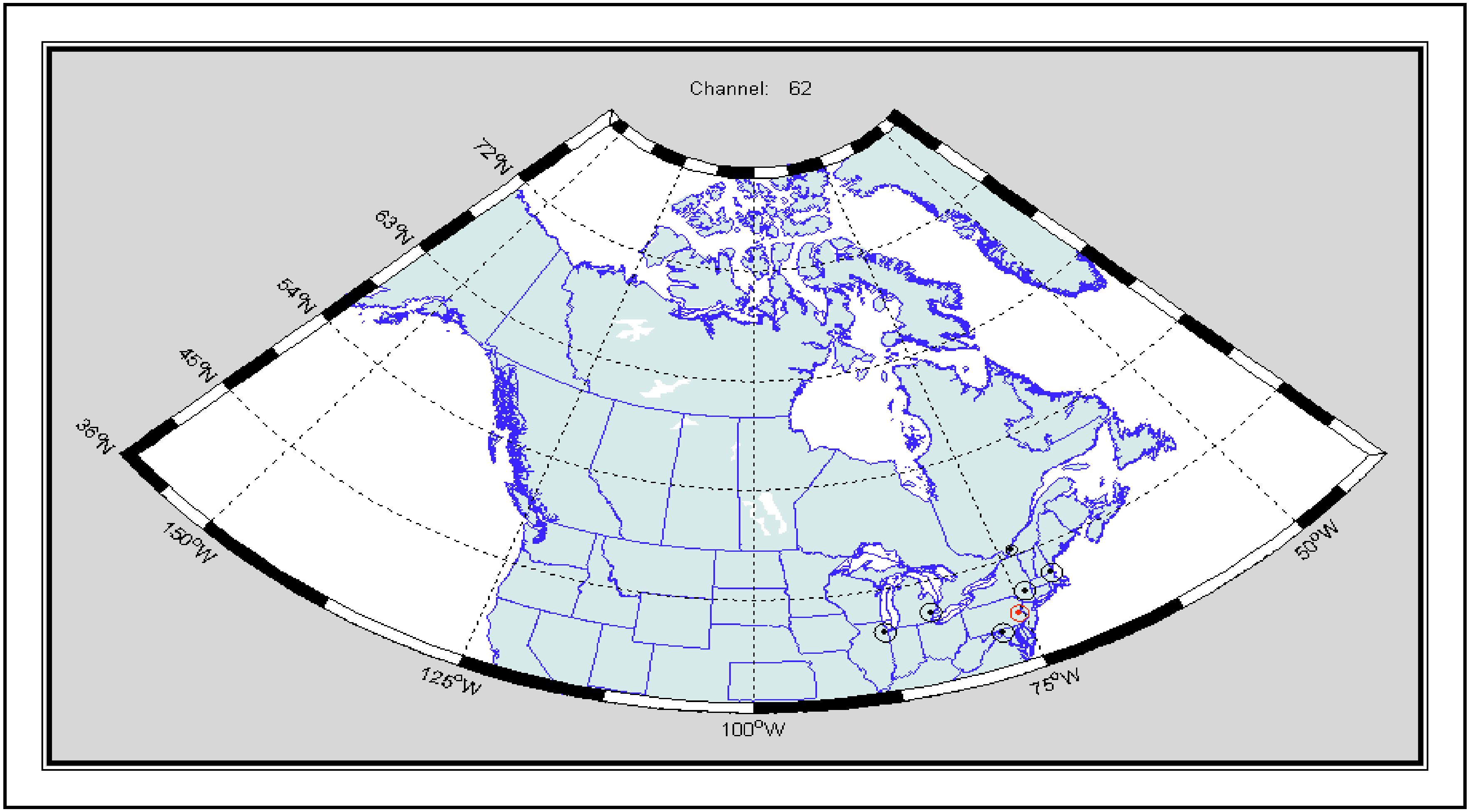


Figure G-4: US DTV, and Canadian Analog TV Affecting Guard Bands - Channel 62

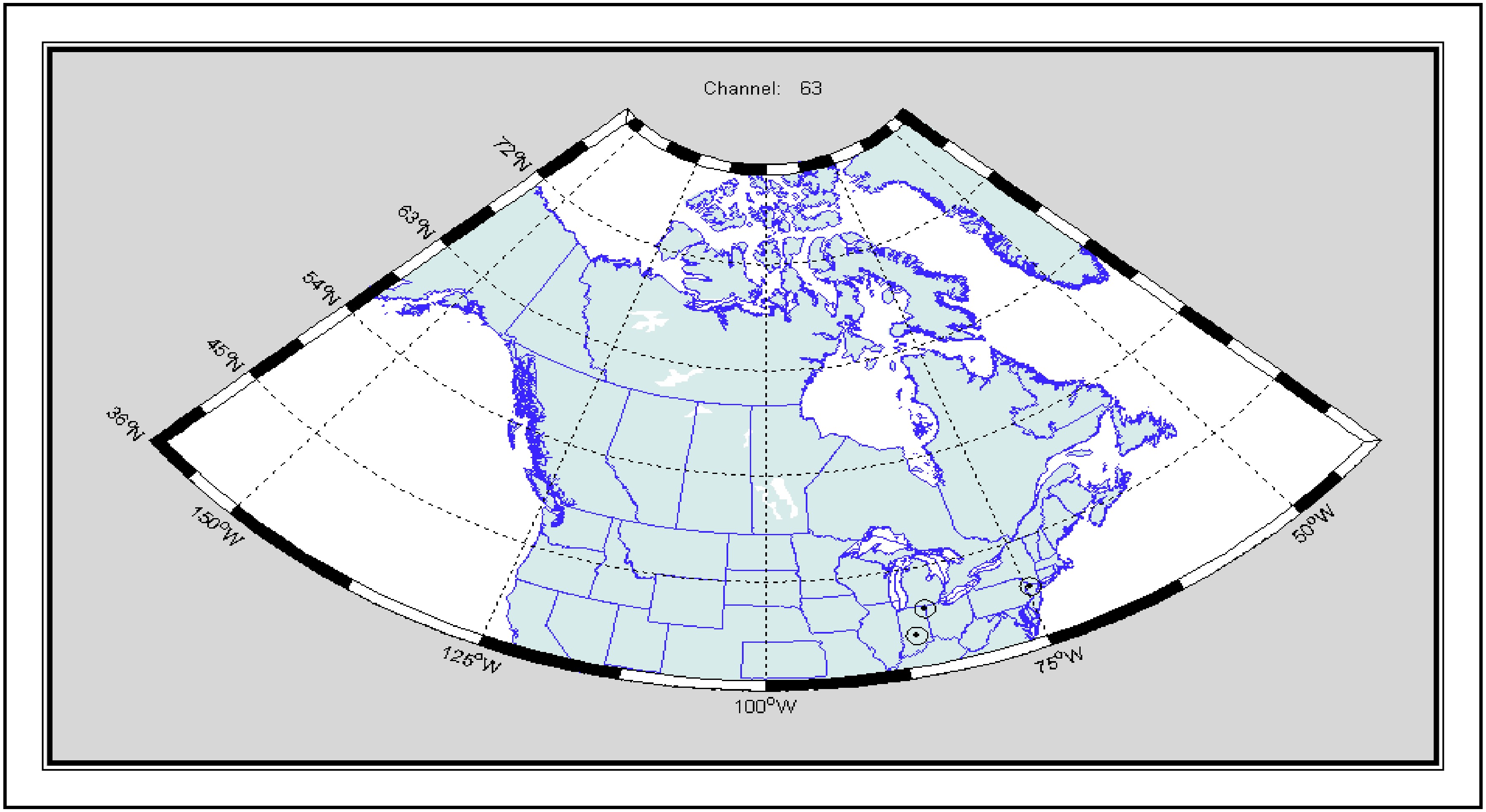


Figure G-5: US DTV, and Canadian Analog TV Affecting Guard Bands - Channel 63

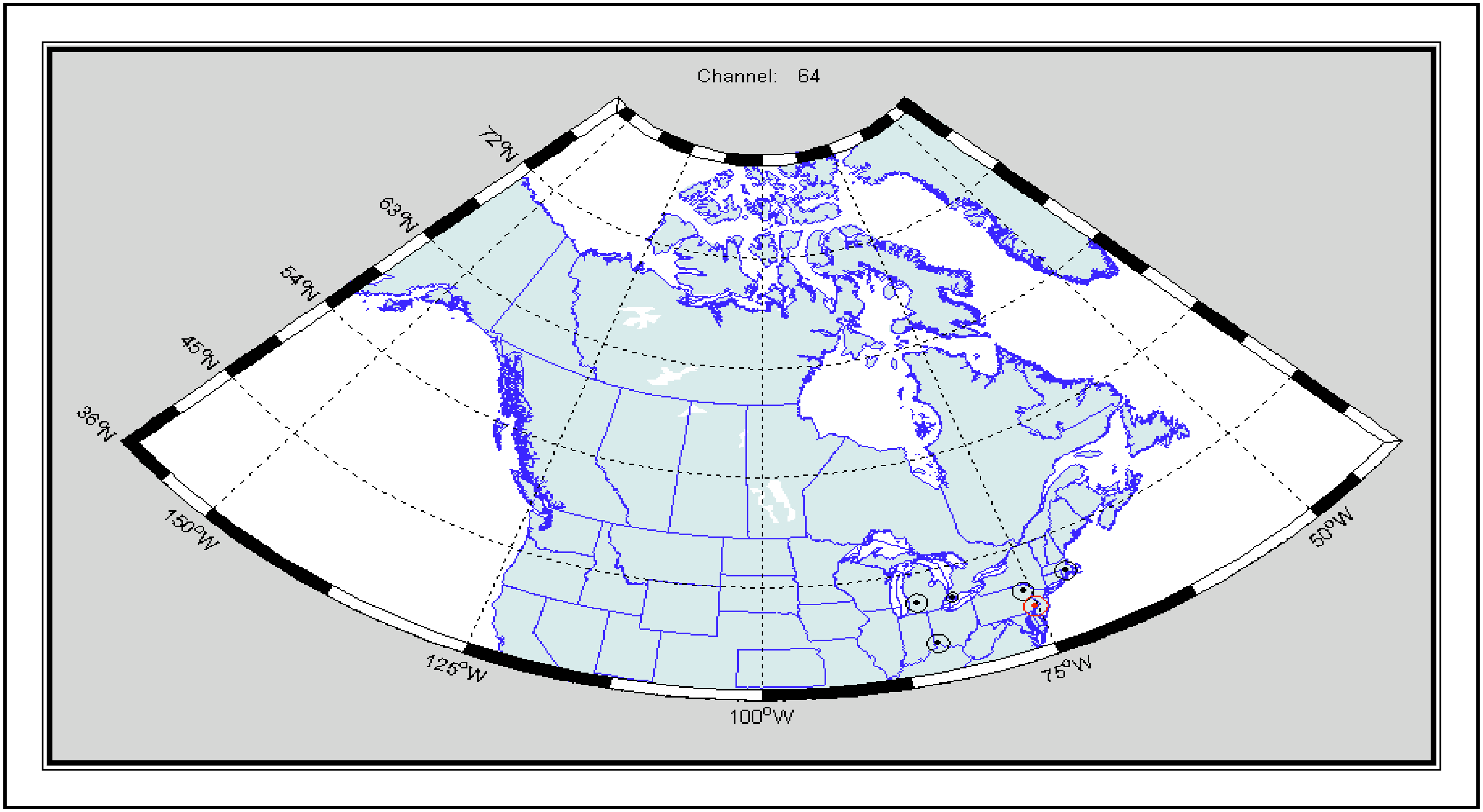


Figure G-6: US DTV, and Canadian Analog TV Affecting Guard Bands - Channel 64

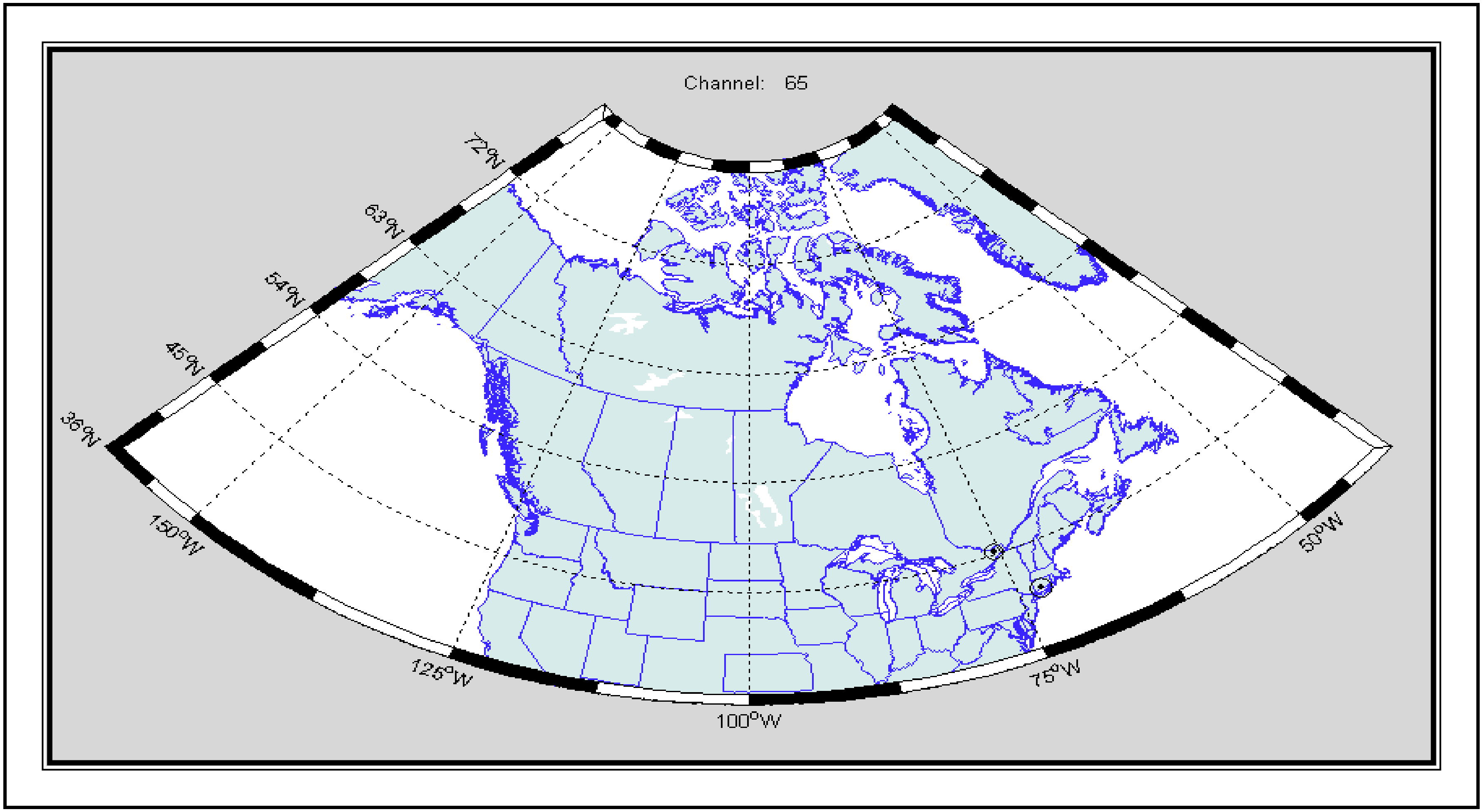


Figure G-7: US DTV, and Canadian Analog TV Affecting Guard Bands - Channel 65

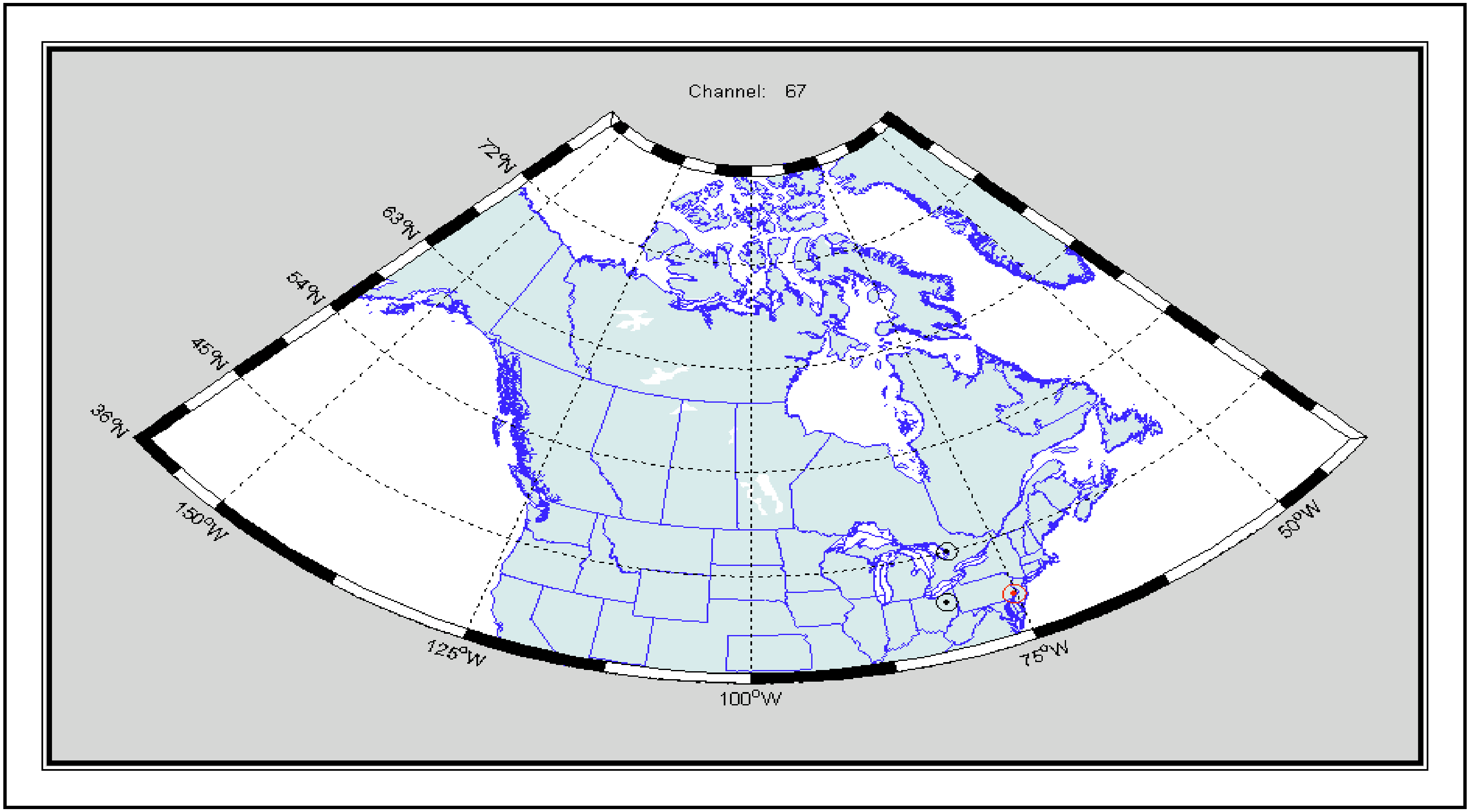


Figure G-8: US DTV, and Canadian Analog TV Affecting Guard Bands - Channel 67

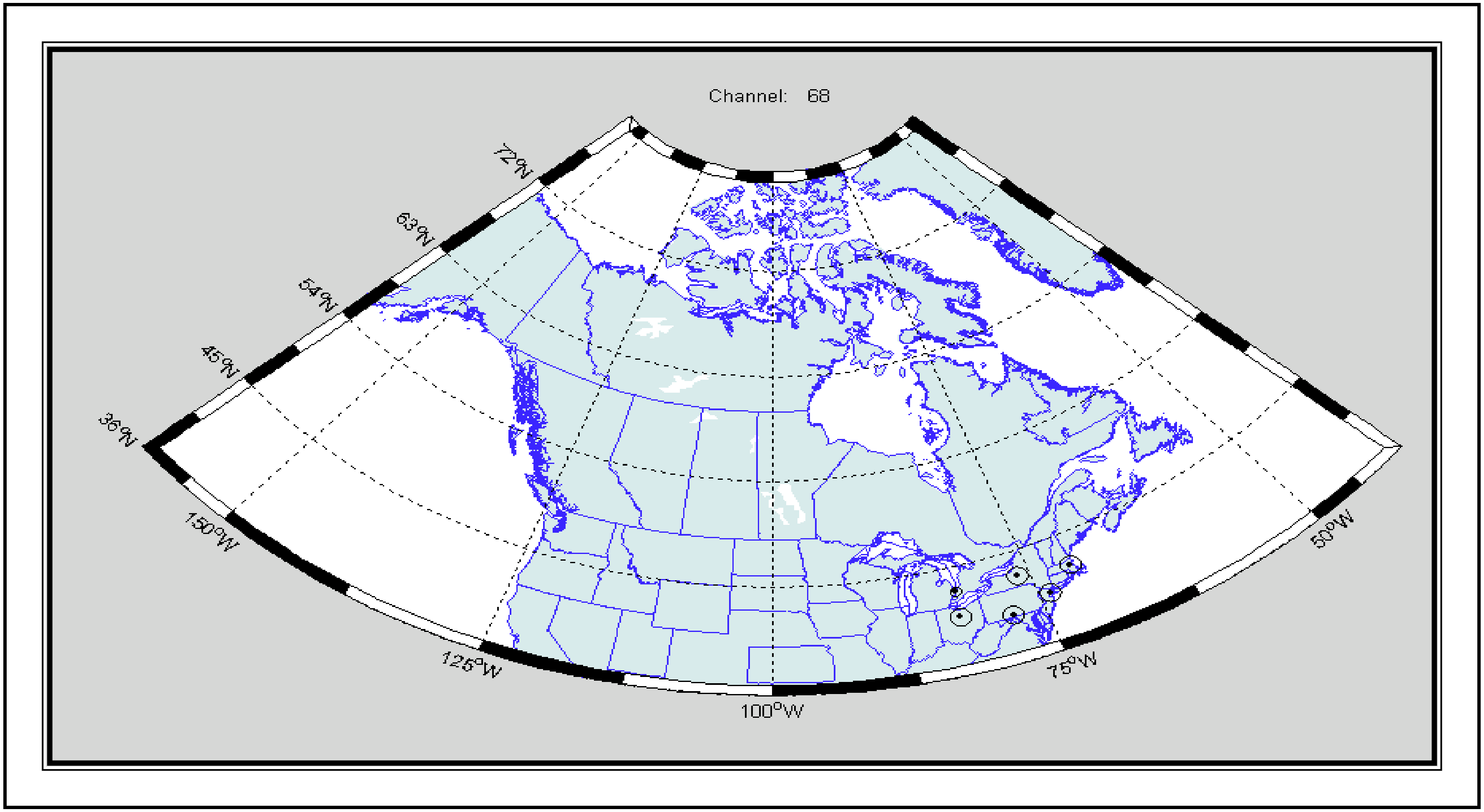


Figure G-9: US DTV, and Canadian Analog TV Affecting Guard Bands - Channel 68

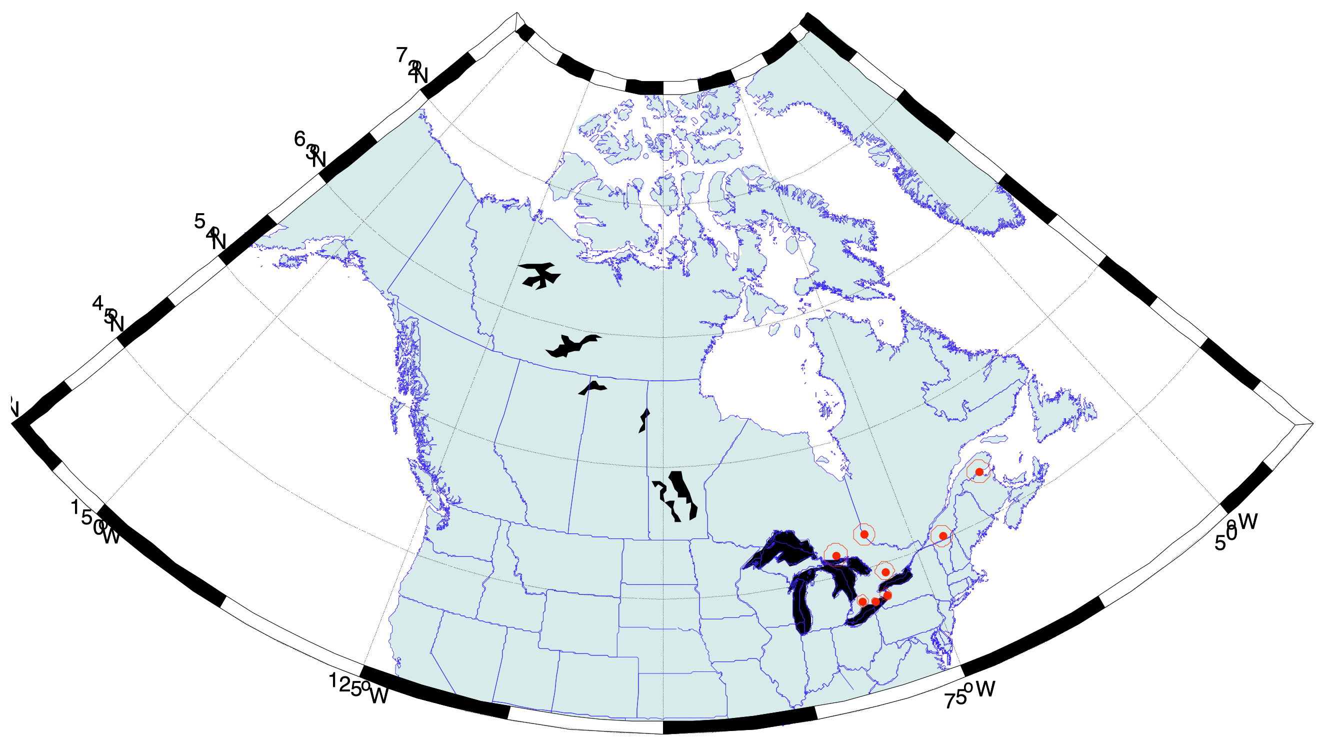


Figure G-10: Canadian DTV Affecting Guard Bands, with Protected Distances - Channel 60

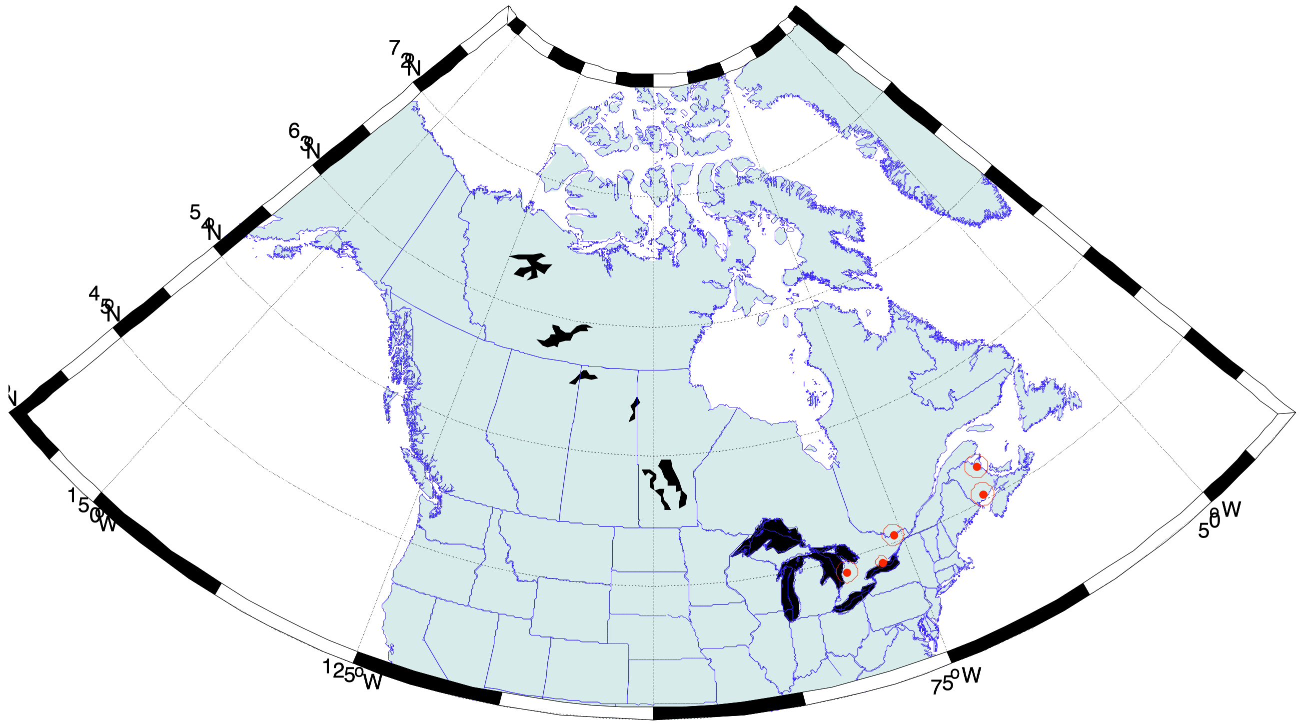


Figure G-11: Canadian DTV Affecting Guard Bands, with Protected Distances - Channel 62

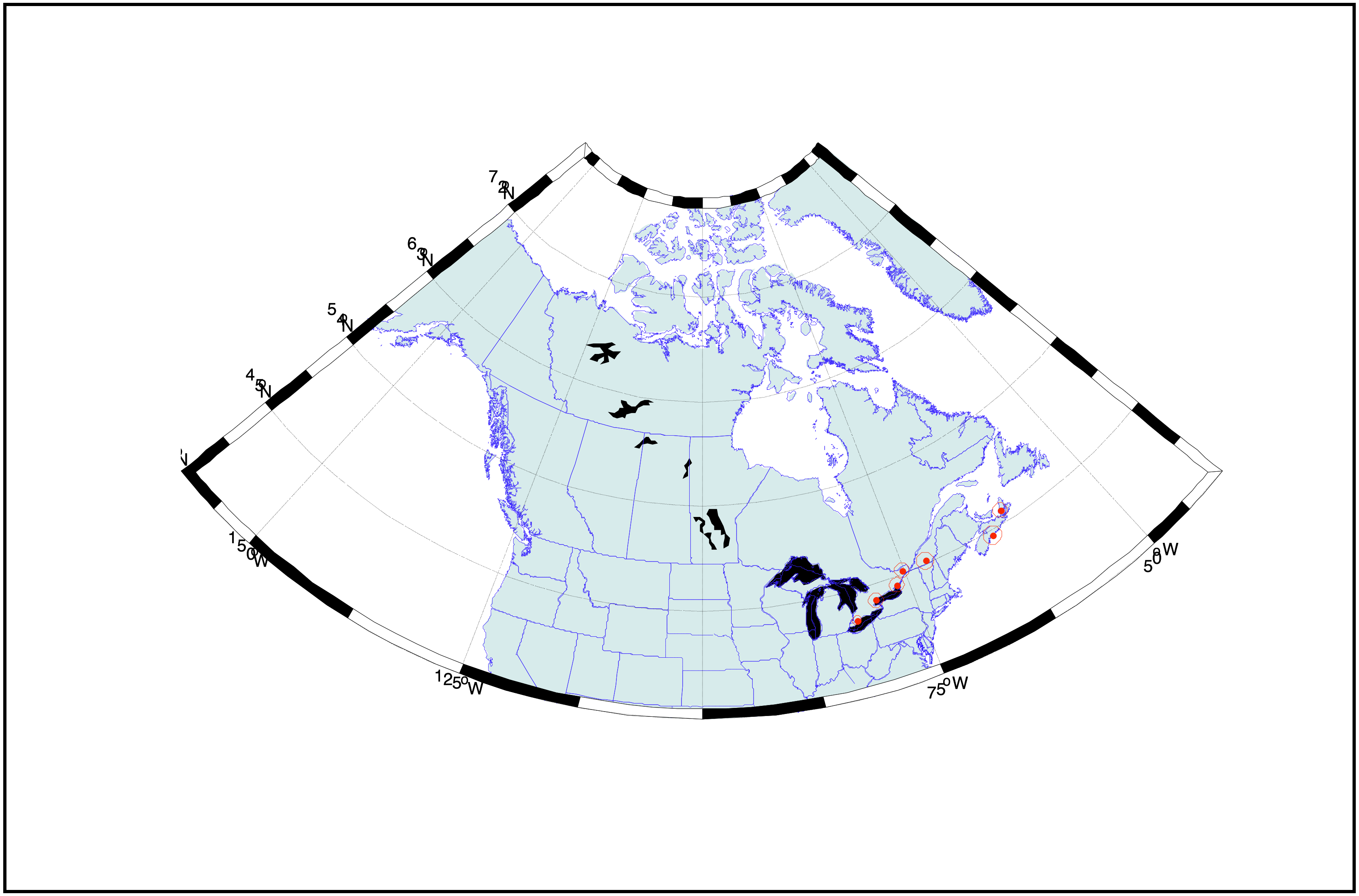


Figure G-12: Canadian DTV Affecting Guard Bands, with Protected Distances - Channel 63

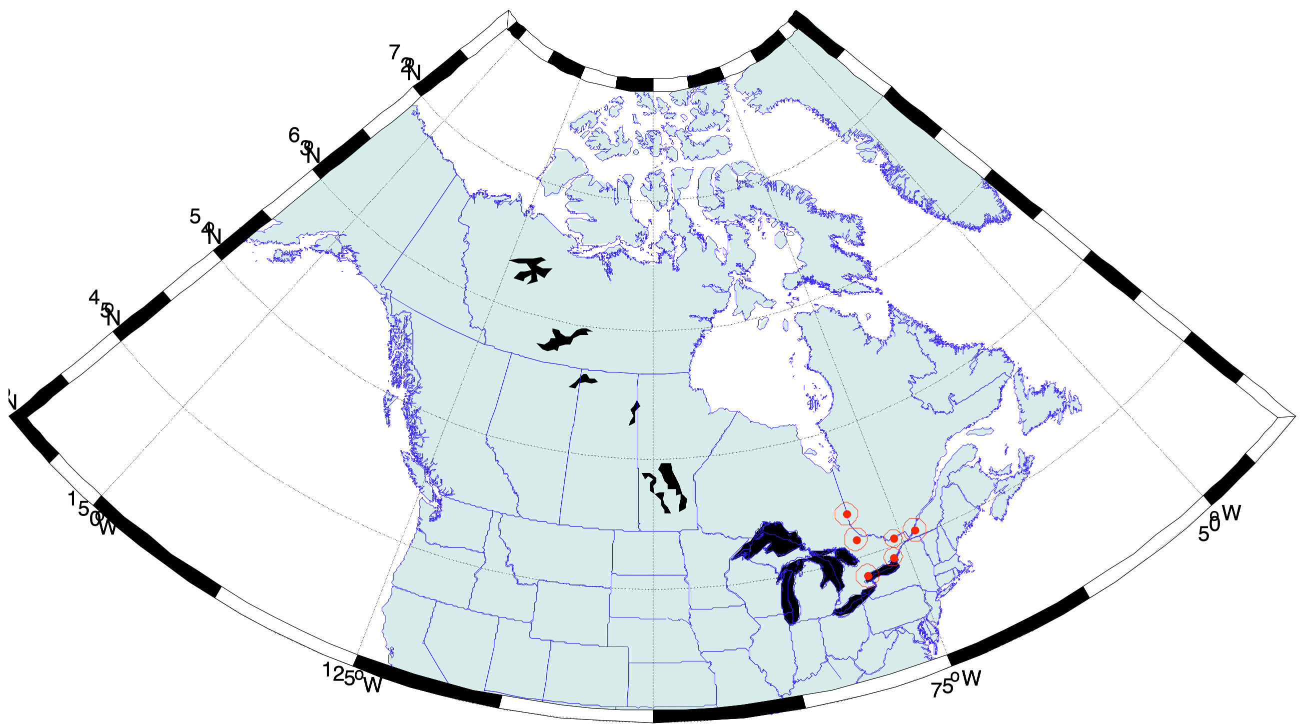


Figure G-13: Canadian DTV Affecting Guard Bands, with Protected Distances - Channel 64

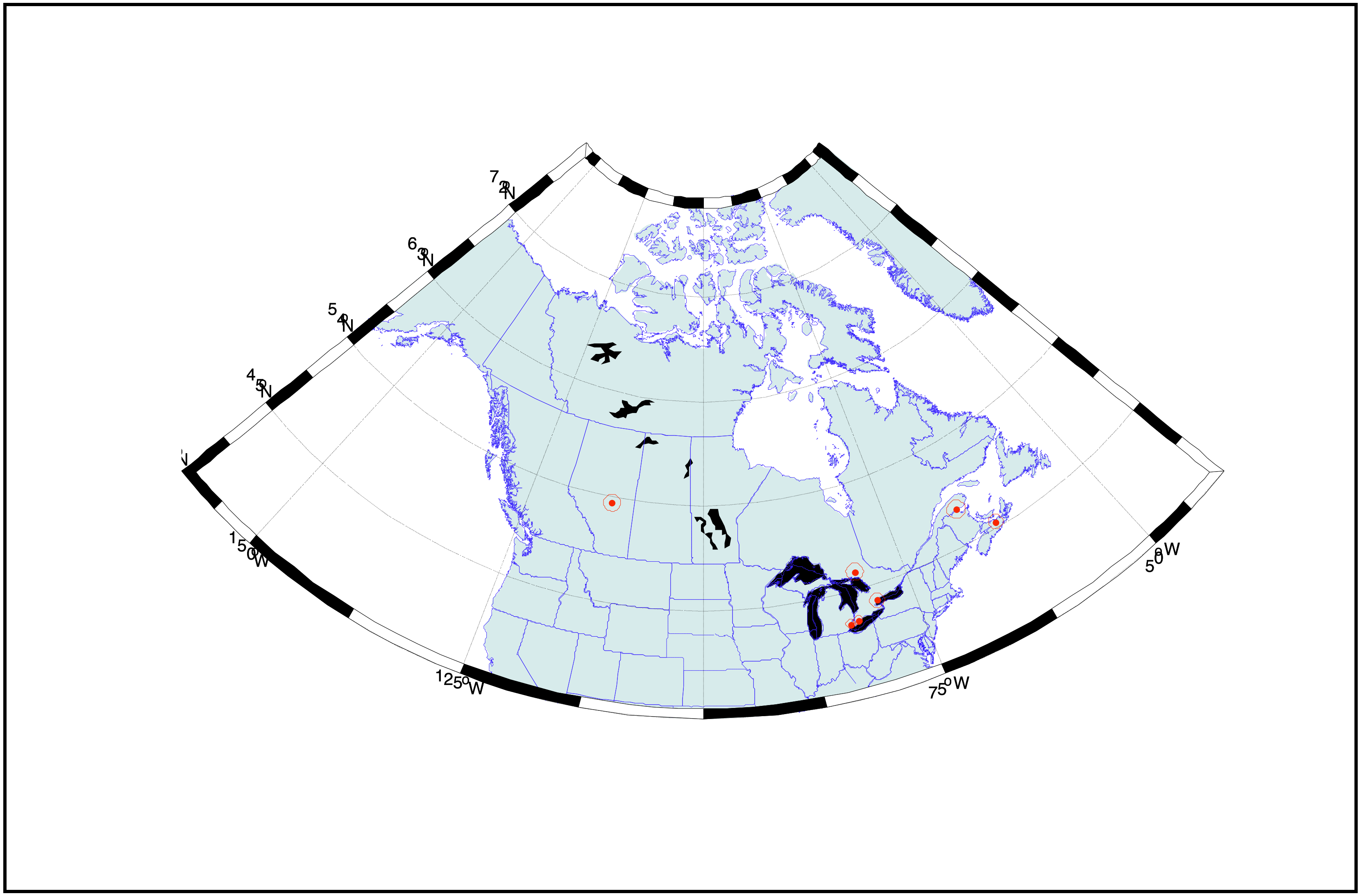


Figure G-14: Canadian DTV Affecting Guard Bands, with Protected Distances - Channel 65

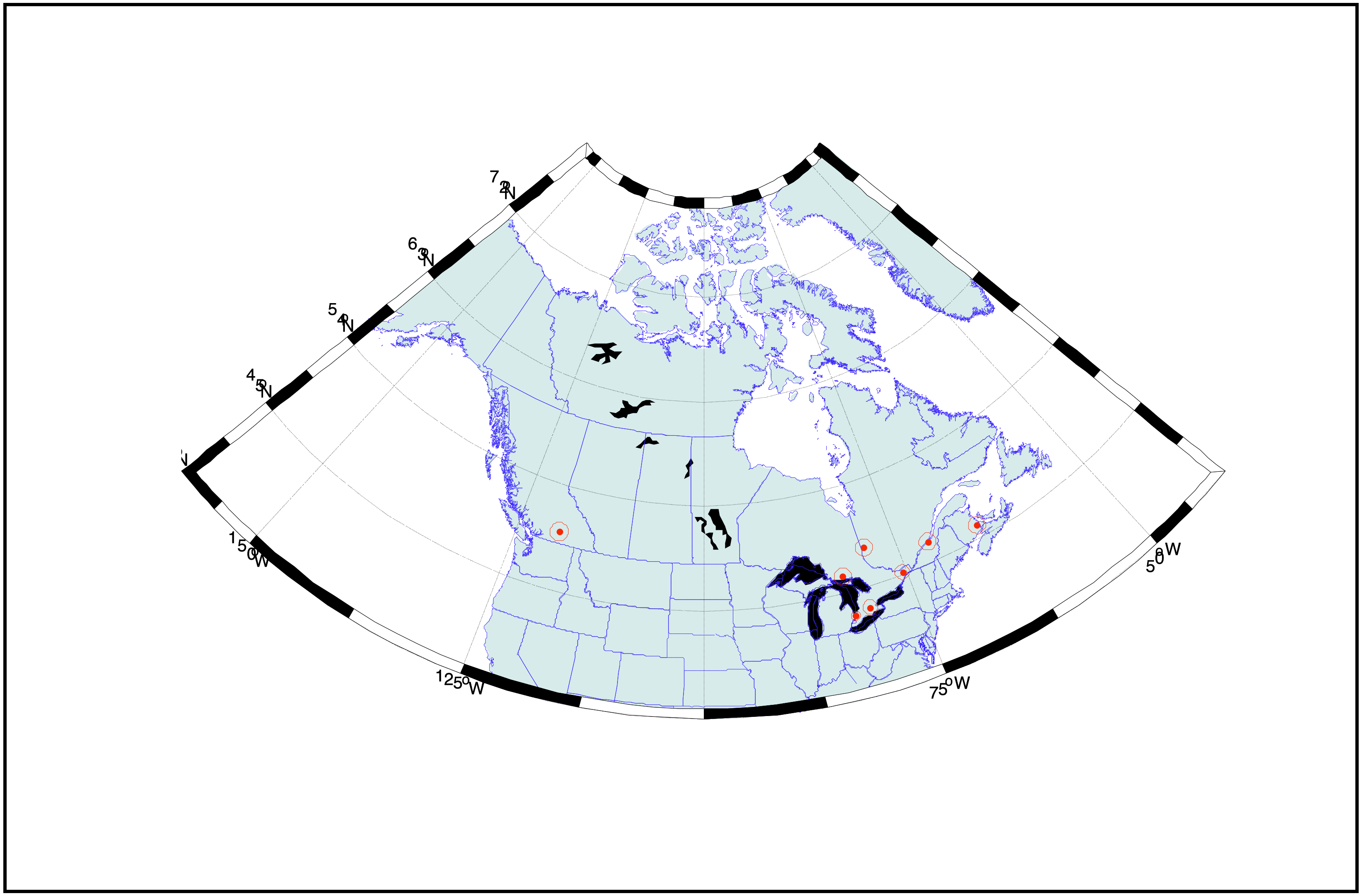


Figure G-15: Canadian DTV Affecting Guard Bands, with Protected Distances - Channel 67

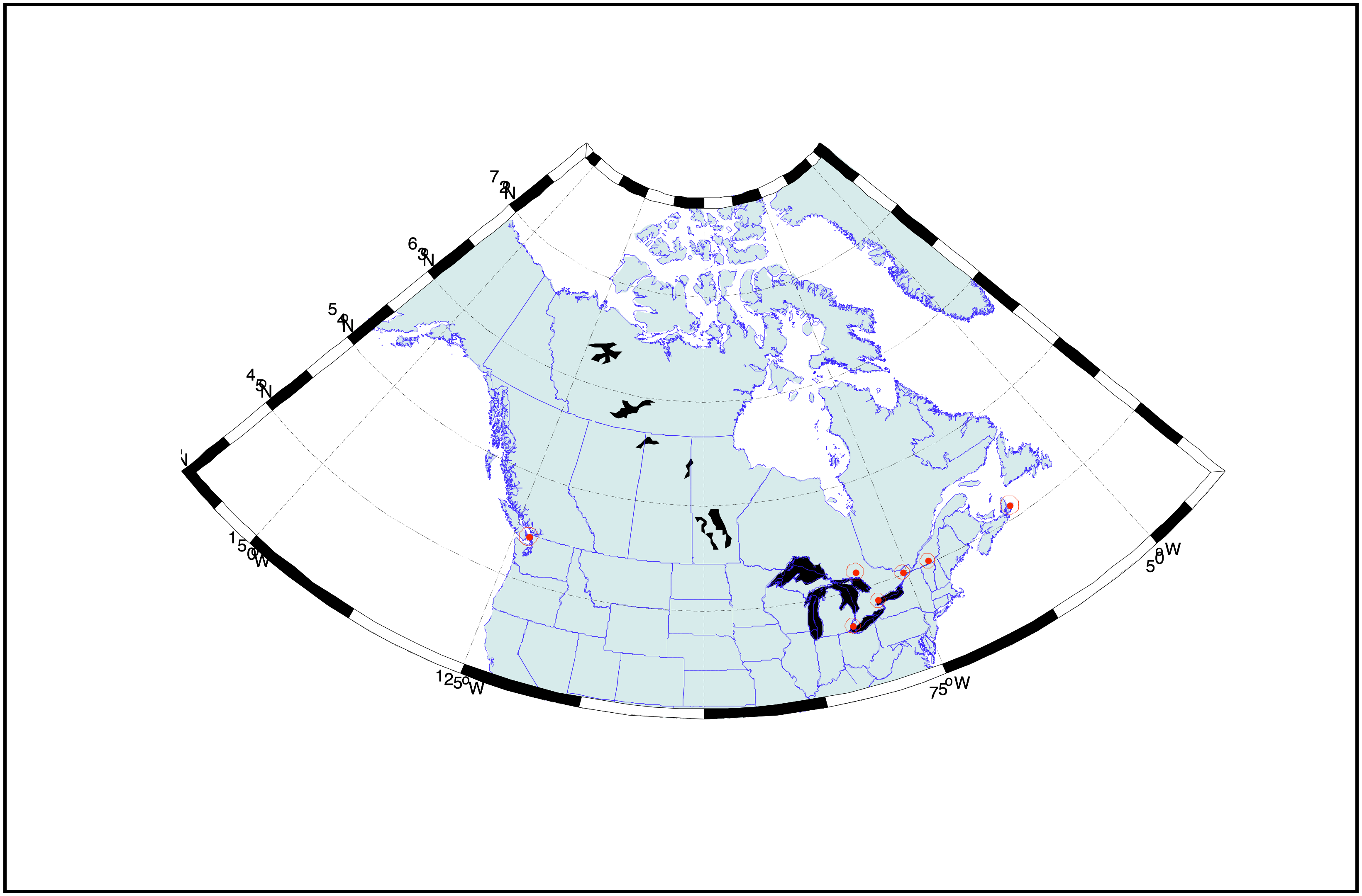


Figure G-16: Canadian DTV Affecting Guard Bands, with Protected Distances - Channel 6

H. 700 MHz: Analog TV and US DTV Blocking - New York State

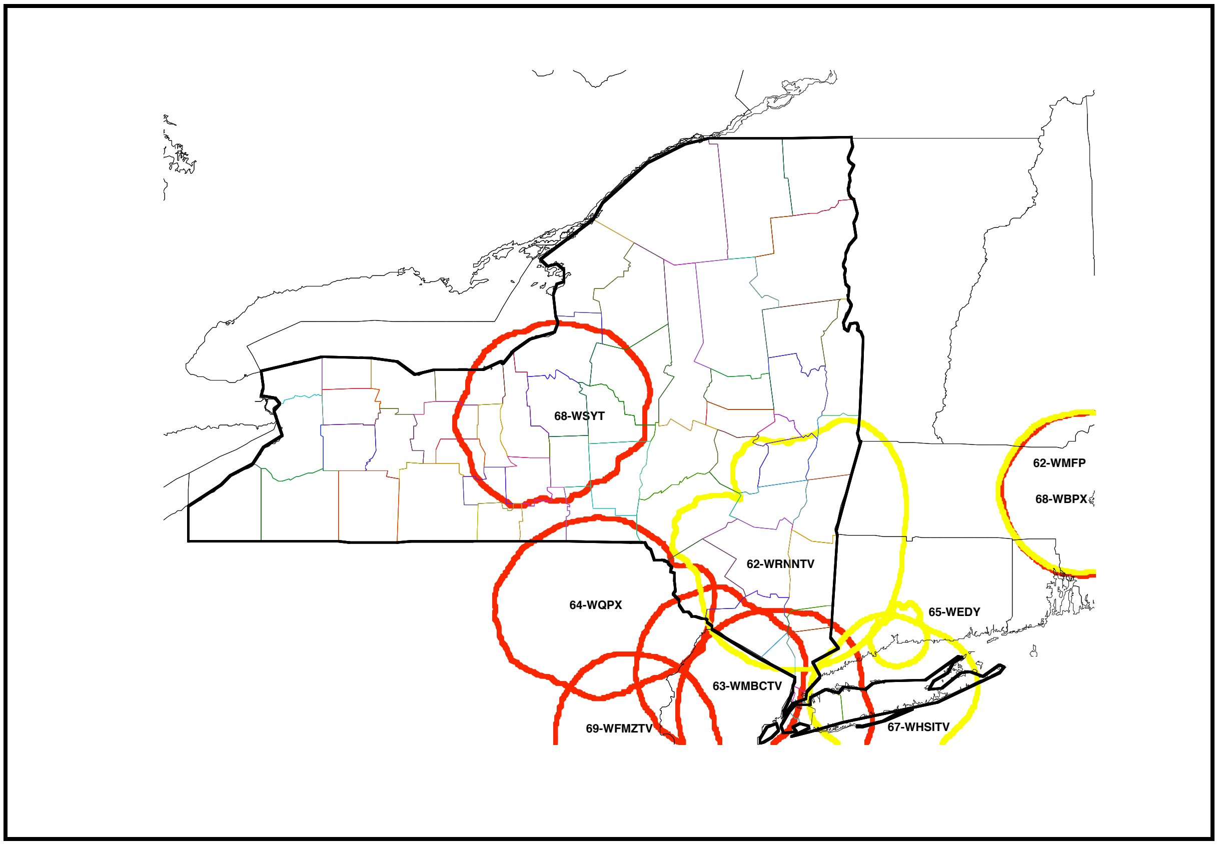


Figure H-1: Incumbent Analog Television Affecting New York State

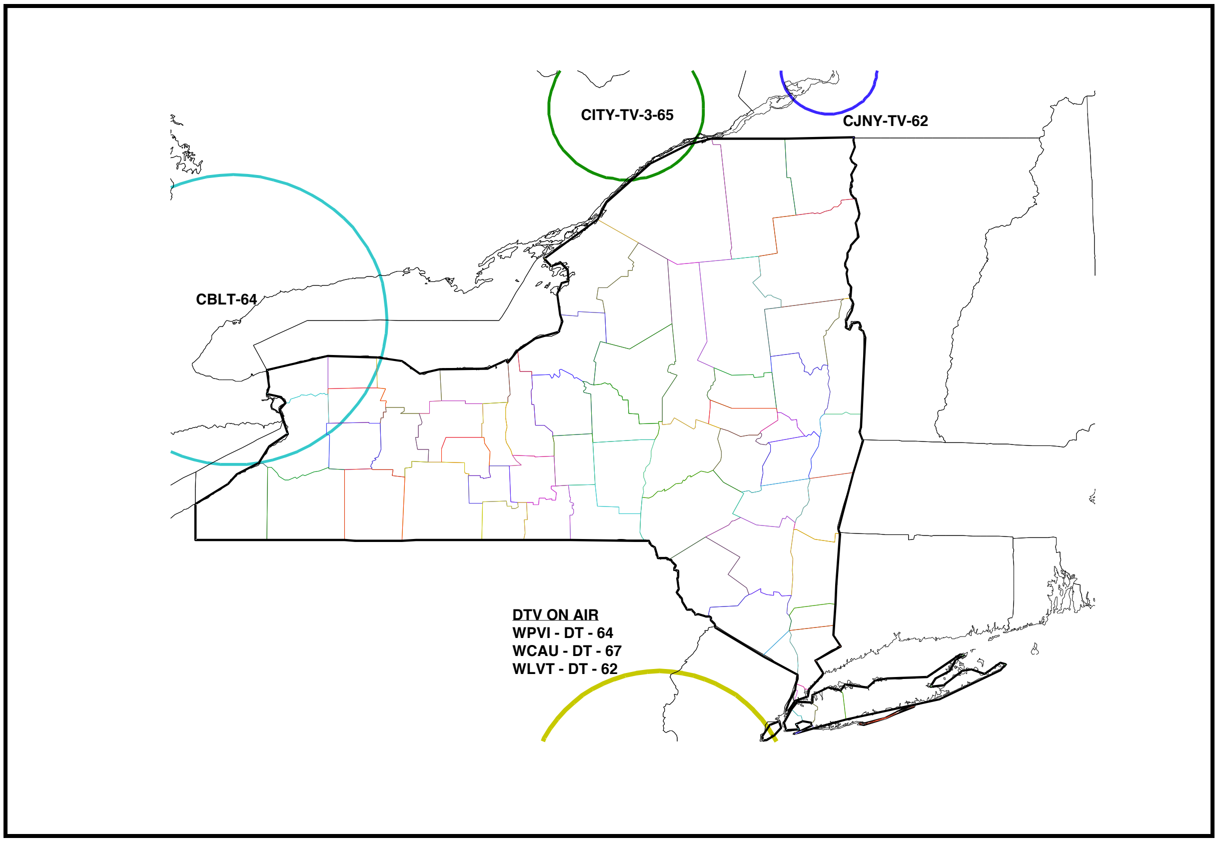


Figure H-2: Canadian Incumbent Analog Television, and US DTV Affecting New York State

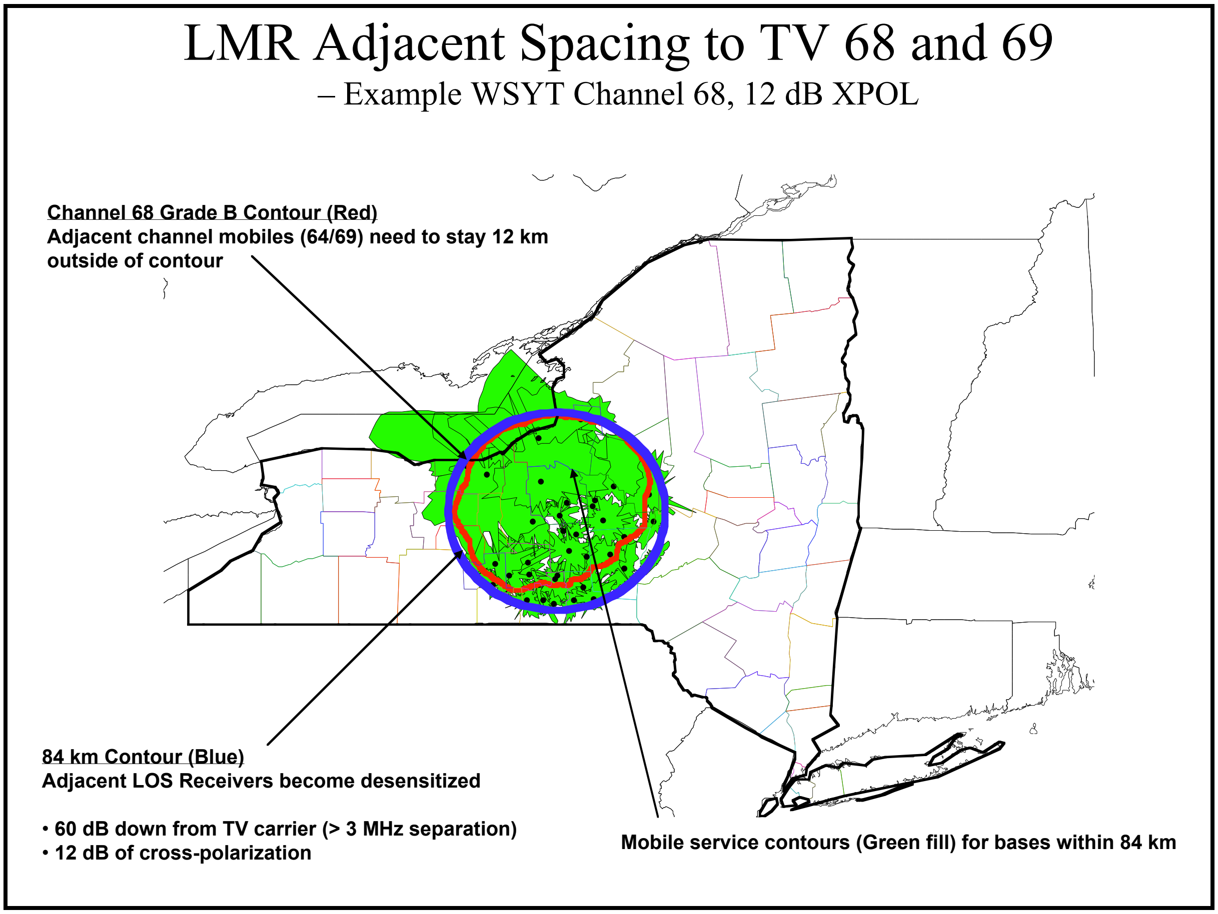


Figure H-3: Example of Adjacent Spacing to Television 68 and 69 - 12 dB Cross Polarization

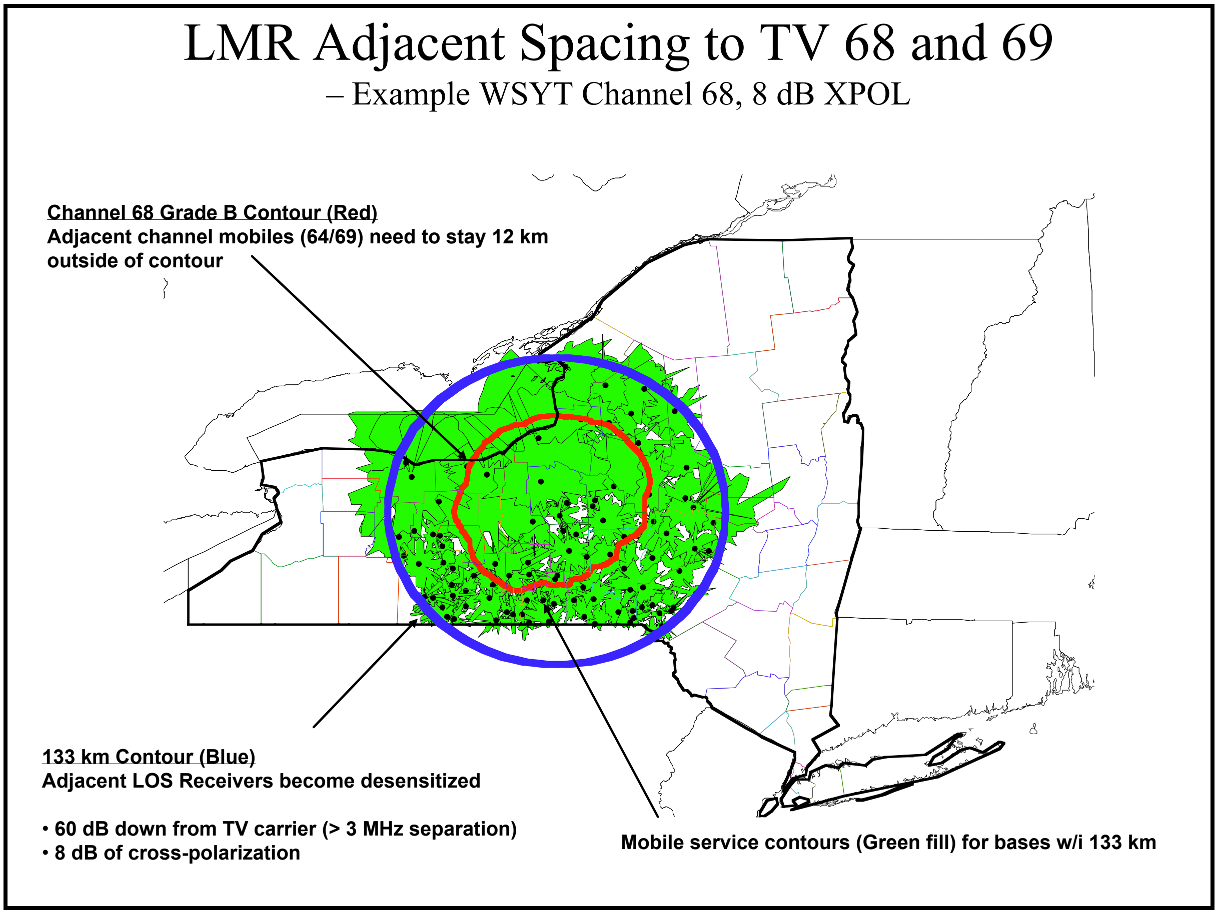


Figure H-4: Example of Adjacent Spacing to Television 68 and 69 - 8 dB Cross Polarization

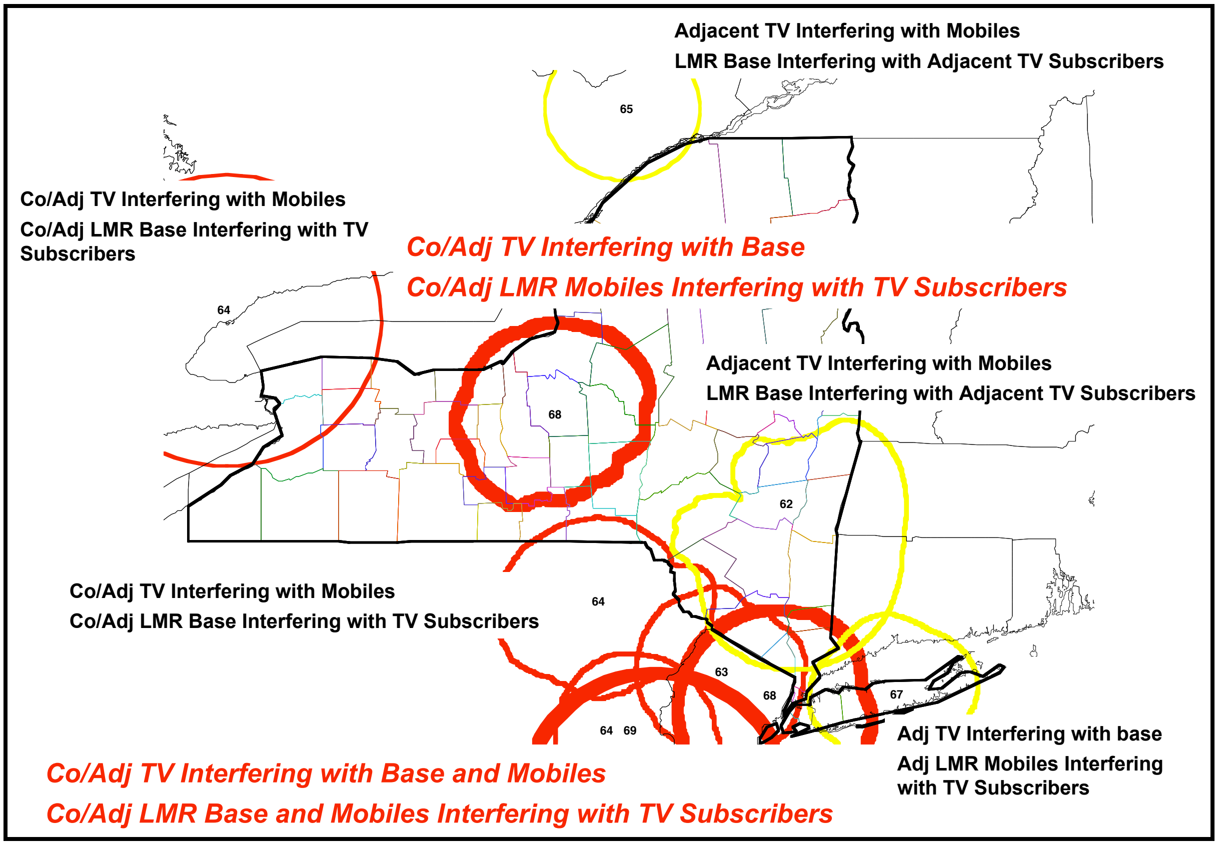


Figure H-5: Television Interference Mechanisms and Considerations

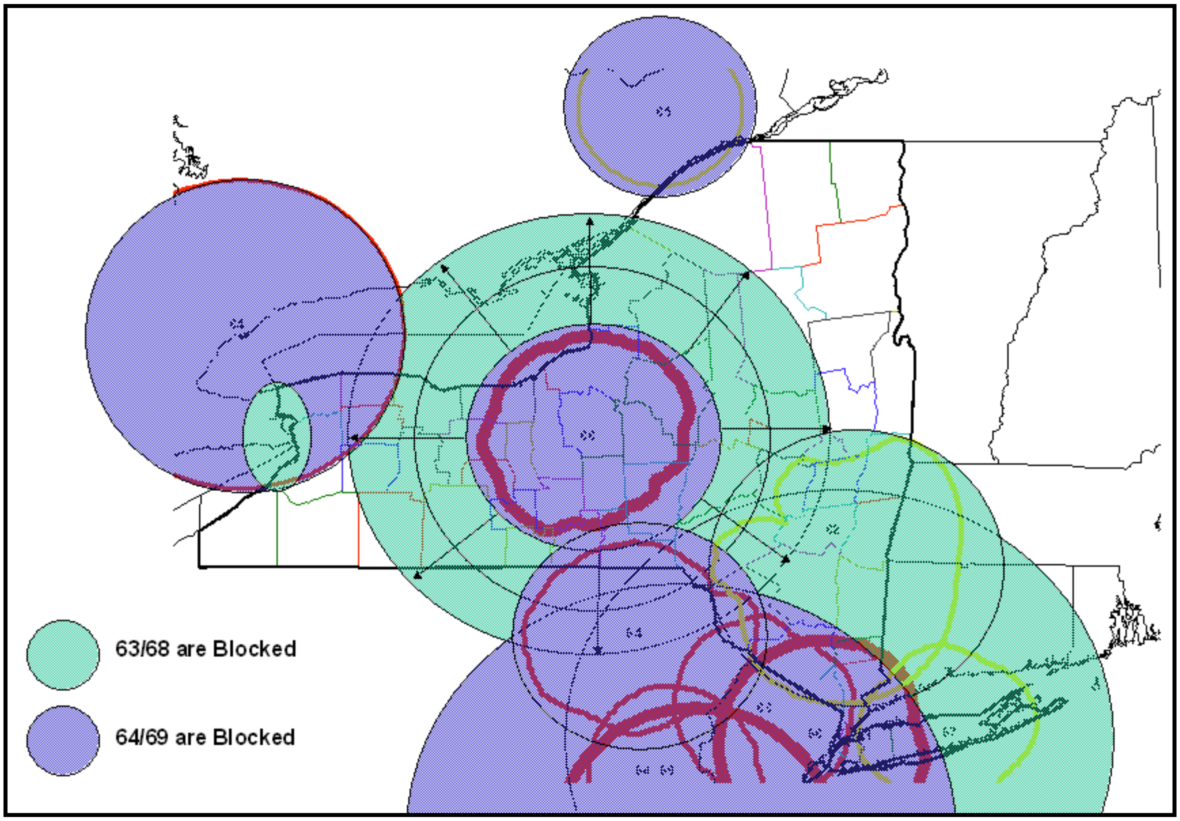
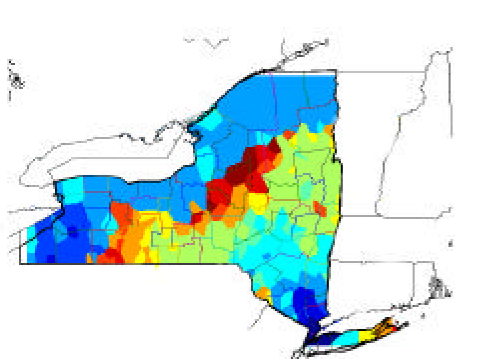


Figure H-6: Currently Blocked Channels in the Vicinity of New York State

I. PRESENTATION: 800 MHZ AVAILABILITY IN NEW YORK

The following documents the methodology that New York State used to investigate the availability of 800 MHz Public Safety spectrum within its borders. The approach taken here is most likely one of the most thorough, accurate, and advanced approaches to determining spectrum availability that have been applied to date.

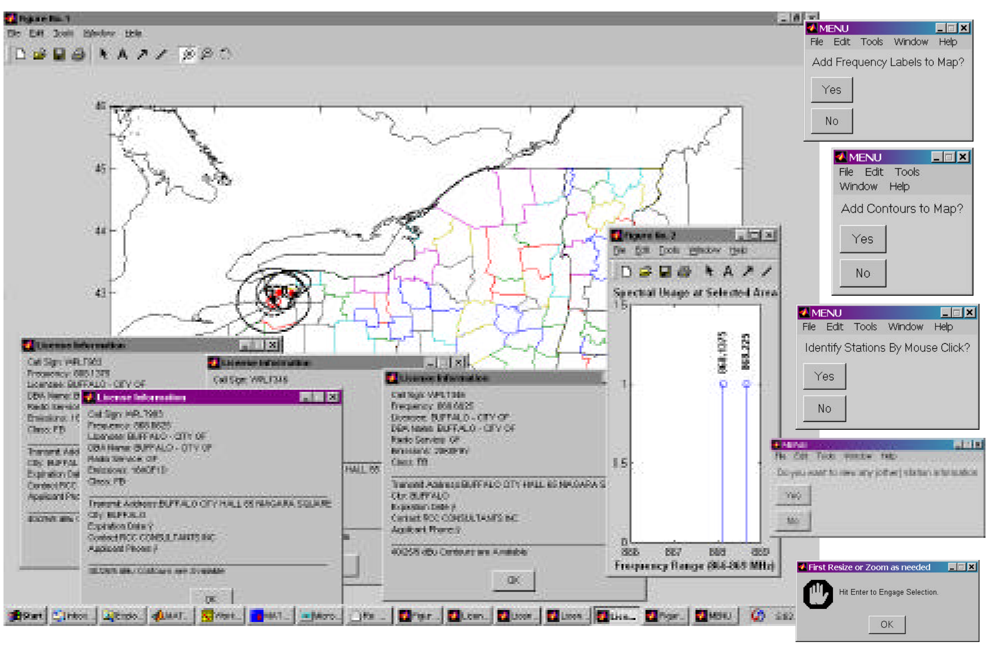
800 MHz
Spectrum
Availability



Identification of Usable Spectrum

- **FCC license data for much of the Northeast US was loaded into a custom database.**
  - Developed for SWN spectrum planning
  - Database provides integrated mapping utilities
- **RPC-approved channel allotments were loaded into the database.**
- **Generated 40, 25, and 5 dBu contours for all of the above (over 13,000 contours).**
  - Okumura-Hata w/ directional HAAT (72 radials per TIA)
  - Contours and HAAT arrays are stored and are integral to the database
  - Contours were provided with the application

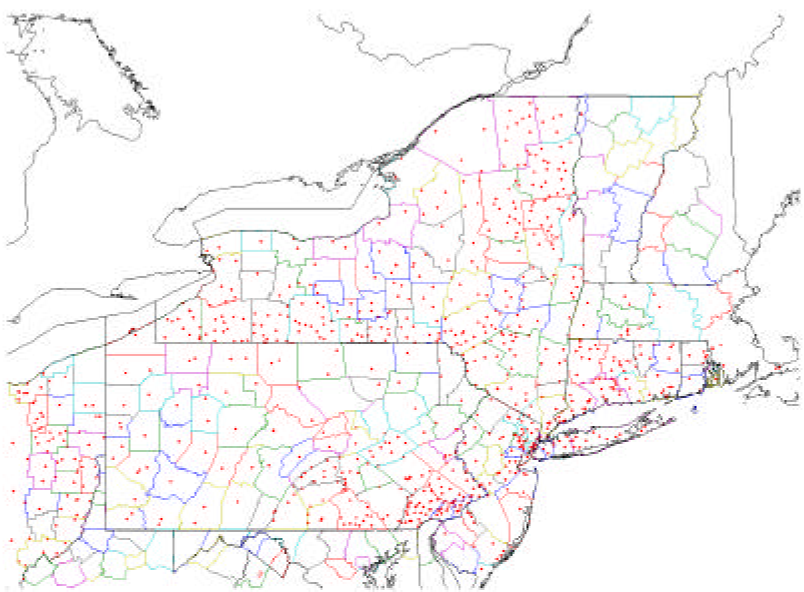
Database User Interface



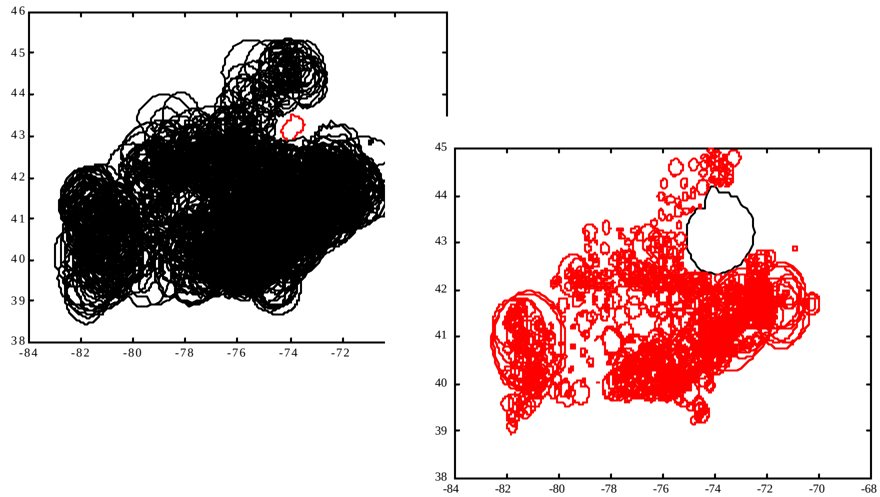
Identification of Usable Spectrum (cont.)

- Computed contours for all preliminary design sites
  - Also utilized actual antenna directivity for these sites
  - Added these to the database
- Identified NPSPAC spectral options <u>for each site</u> through examination of contour intersections
  - Co-channel 5 dBu to 40 dBu, & vice-versa
  - Adj-channel 25 dBu to 40 dBu, & vice-versa
- Similar process followed for 806 MHz, except <u>site separation and DHAAT</u> were employed as spectrum identification criteria

Database Locations for NPSPAC Search



Example of Spectral Identification Results



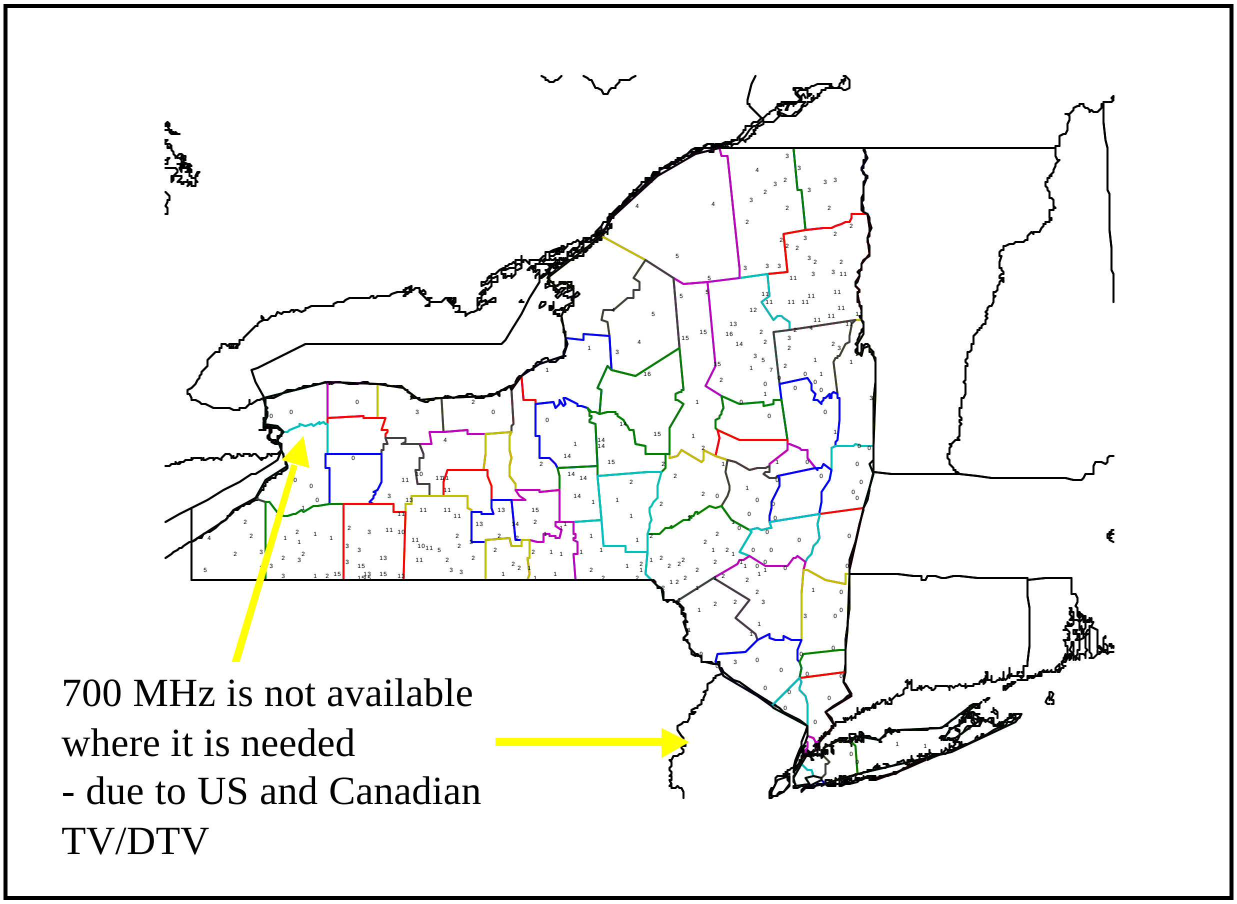


Figure I-1: Maximum Available 806 MHz Channels (w/Reuse)

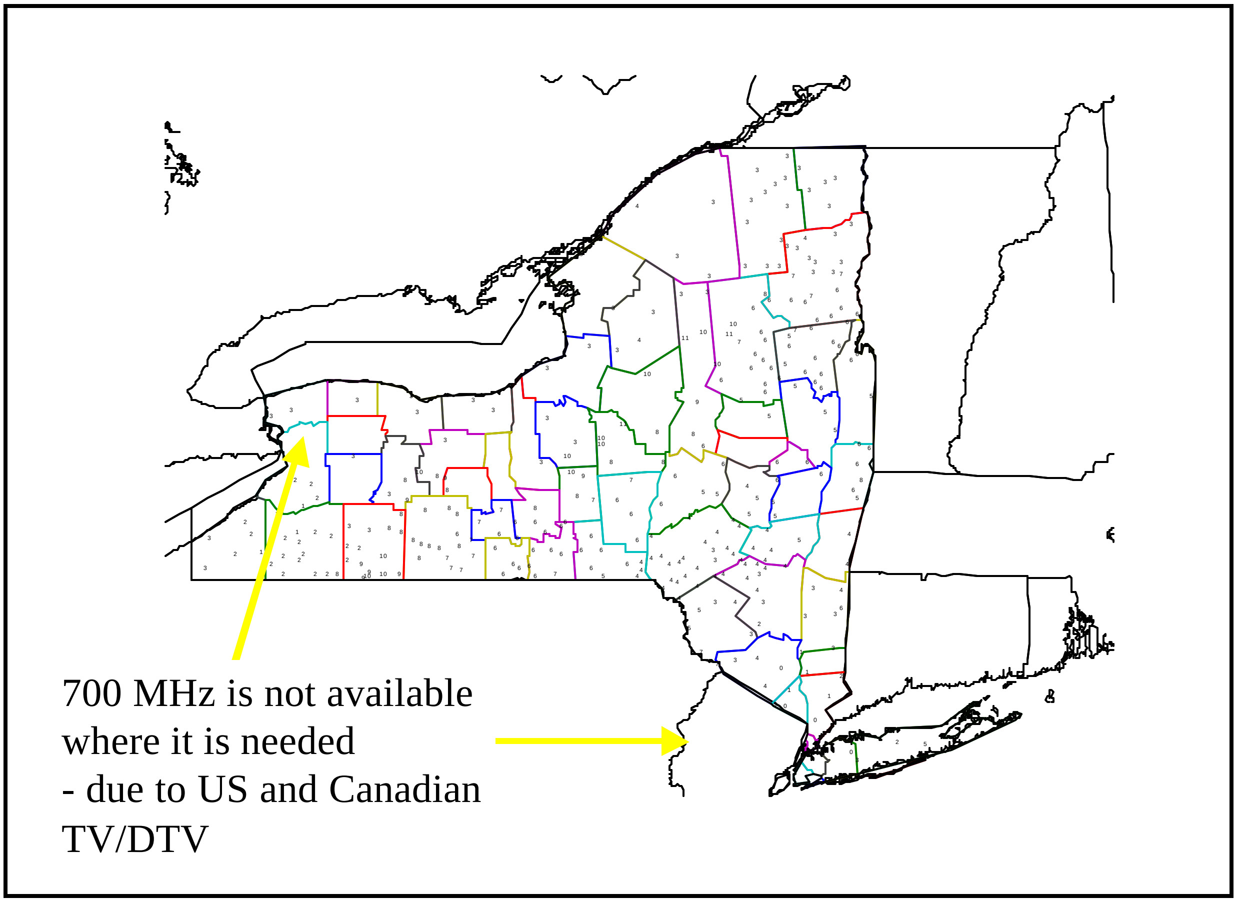
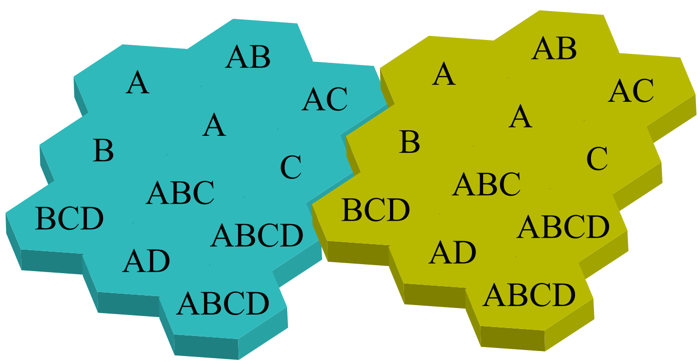


Figure I-2: Maximum Available NPSPAC Channels (w/Reuse)

J. PRESENTATION: SWN SPECTRUM/CAPACITY NEEDS

The following documents the methodology that New York State used to model the capacity requirements for its statewide public safety wireless communications system. The approach taken here is most likely one of the most thorough, accurate, and advanced approaches to modeling traffic distributions and determining statewide public safety capacity requirements that have been applied to date.

Traffic and User Models



SWN Will Support:

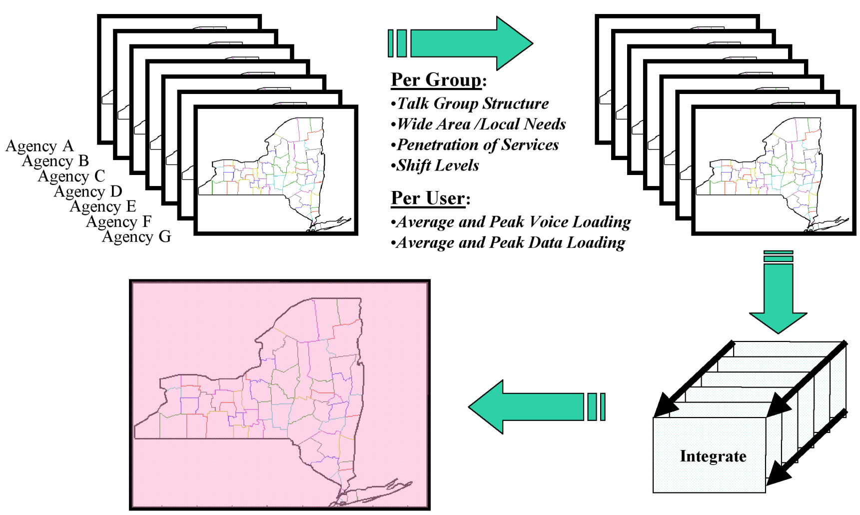
–***Multiple Agencies and a Large User Base***
–***A Large Number of Talk Groups***
–***Point-to-Point and Multicast Mobile Communications***
–***Voice and Data Operations***

SWN Traffic Modeling

- **Local Traffic**
  - **Uses “User” and “Traffic” density grids.**
  - **Based upon users within the area captured by a given coverage contour.**
  - **Users are then converted, group by group, to radio traffic**
  - **This drives channel requirements**

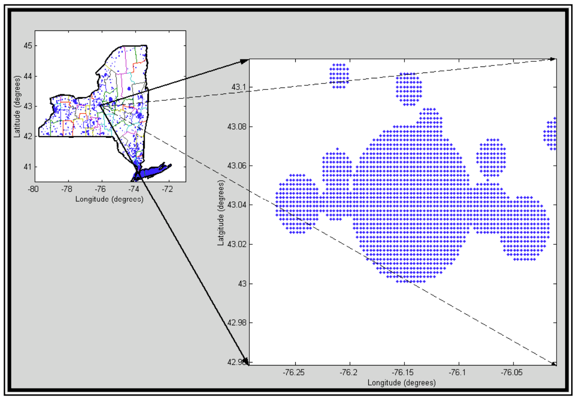
- **Wide Area Traffic**
  - **Uses county level talkgroup loading**
  - **Based upon users in all counties with any area captured by a given coverage contour.**
  - **Users are then converted, group by group, to radio traffic**
  - **This drives channel requirements**

Traffic Grid Concept



SWN Traffic Density Grid

Traffic Grid Resolution



- The sample points in the traffic Grid are evenly spaced -every 250 m, in both latitude and longitude (~42/mi[2])

•The average County has 33,000 sample points (range of 400 to 117,000 points).

•The average City or Village has 146 sample points (range of 4 to 13,000 points).

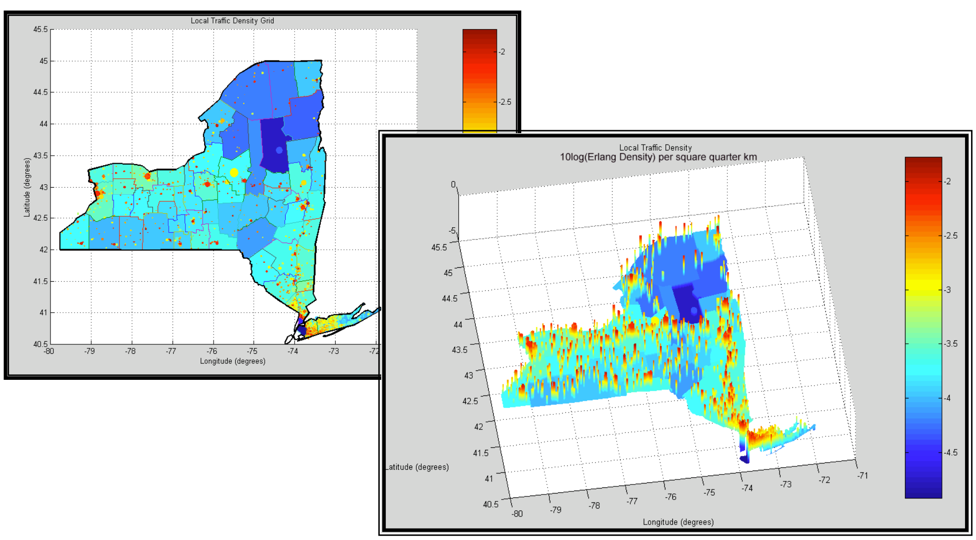
Agency Traffic Parameters

- User populations were translated into traffic loading through the consideration of:
  - Voice and Data Service Penetrations – The expected fraction of user population requiring a particular communications process.
  - Operational Time Schedules – The expected fraction of user population active during the typical busy-hour of the day.
  - Average per Unit/User Loading – The expected per-user traffic loading averaged over the course of a day.
  - Peak per-Unit/User Loading – The expected per-user traffic loading during the busiest one-hour period of a day.
  - Wide Area, Local, and Off-System/Tactical Communications Percentages.
- Determined through user interviews & PSWAC

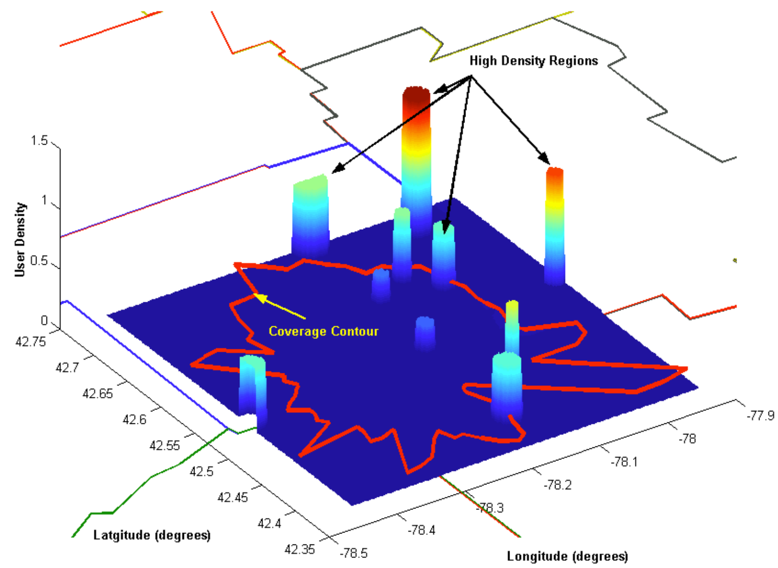
Spectrum Requirements

- Site Capacity
  - Uses the coverage contours to “capture” traffic from the density grid
  - Integrates this “local traffic” with the wide-area communications traffic of the captured user groups
    - To handle local and wide-area communications
- Site Channel Requirements
  - Using Erlang-C, the site capacity translates to site channel requirements
  - Similar methodologies were recommended by PSWAC
- Total Spectrum Required for SWN
  - Function of both the total site channel requirements, and the effective frequency reuse of system

Local Traffic Density from Aggregate Grid



Coverage Contour Traffic Capture (Example, Fire)



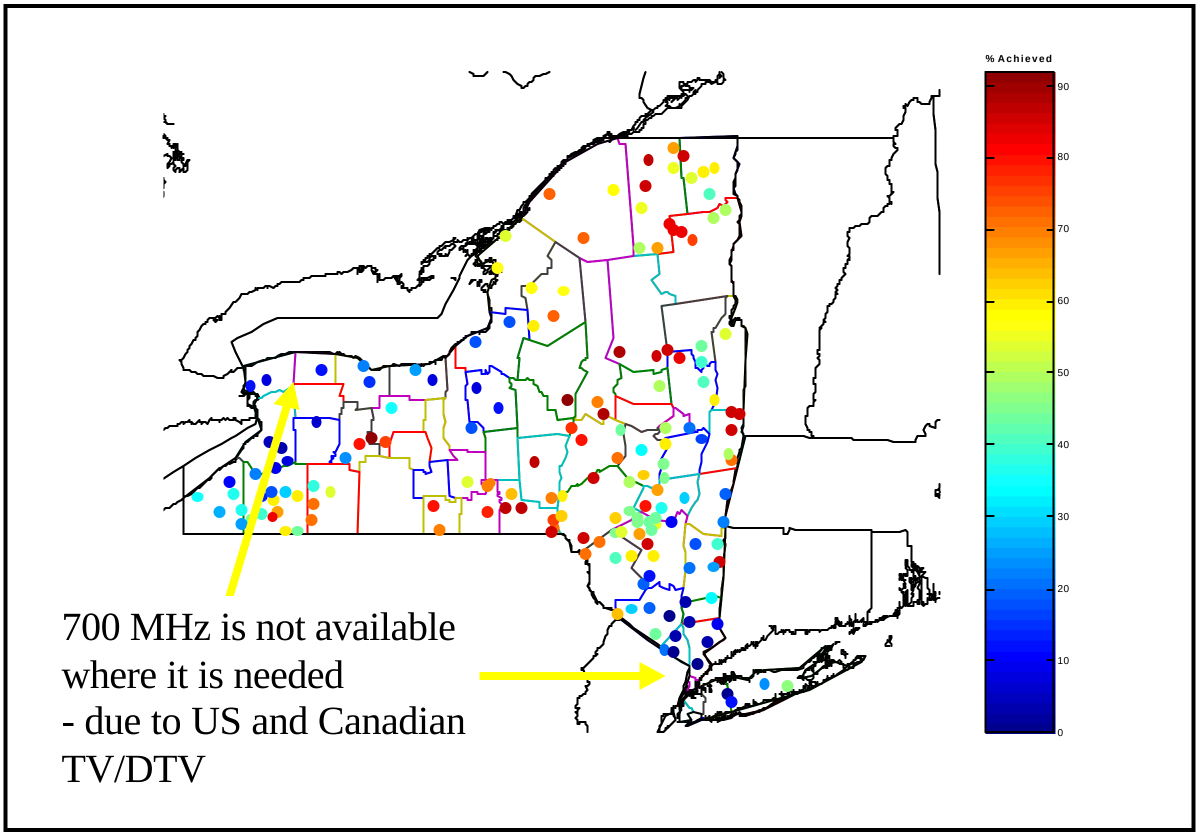


Figure J-1: Areas where 800 MHz Spectrum Does Not Meet SWN Capacity Estimates

Figure J-1 shows the geographic percentage of SWN capacity that can be met through available 800 MHz public safety spectrum. Clearly 700 MHz is not available where it is needed most.

K. OUT-OF-BAND EMISSIONS (OOBES)

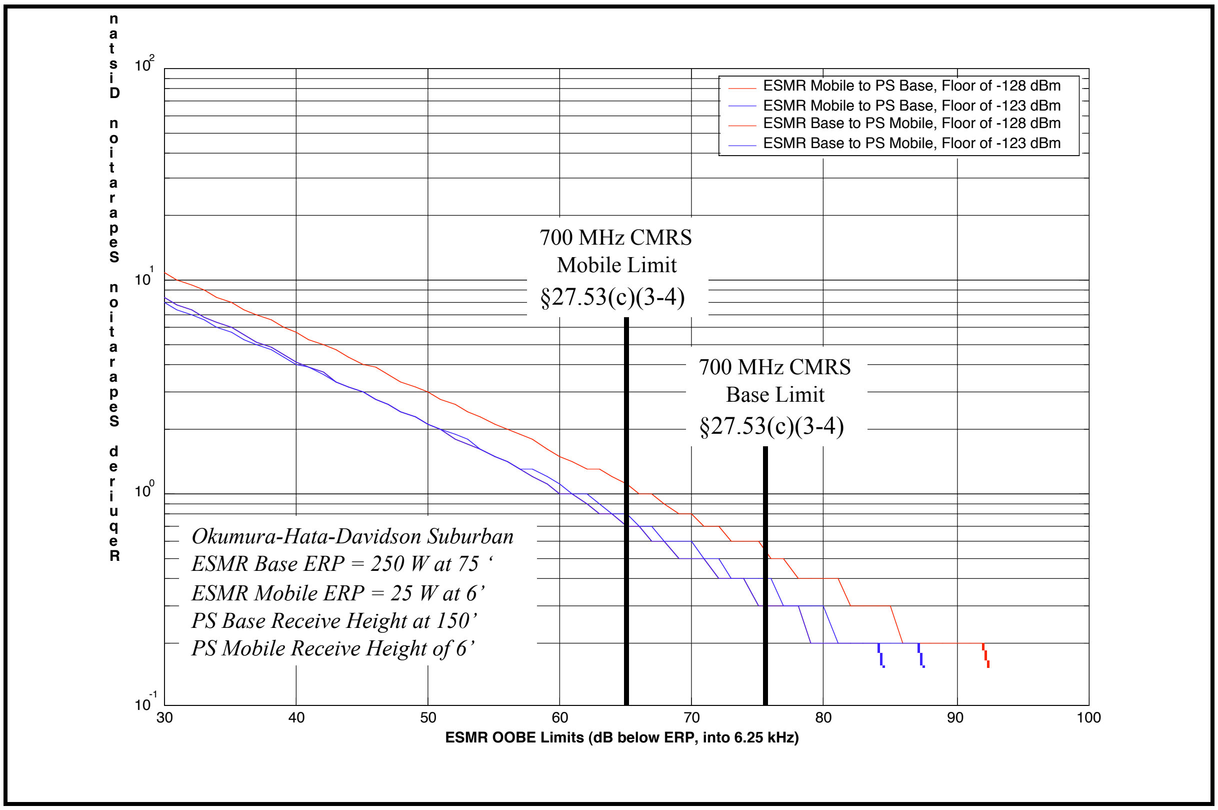


Figure K-1: Public Safety/ESMR Separation vs. Out-of-Band Emissions

Figure K-1 represents the separation distance versus ESMR OOBE requirements (into 6.25 kHz), as adopted in the Commercial 700 Hz spectrum allocation[1]. The separation distances are evaluated for both ESMR mobile to PS base, and ESMR base to PS mobile. Separations are also considered at cases of Public safety sensitivity degradation corresponding to thermal noise levels of -123 and -128 dB (*ENBW* = 10 kHz, N_f = 6dB, and 11 dB respectively). It is evident that these levels represent what should be a minimum recommendation for the OOBE.

[1] §27.53(c-3,4)

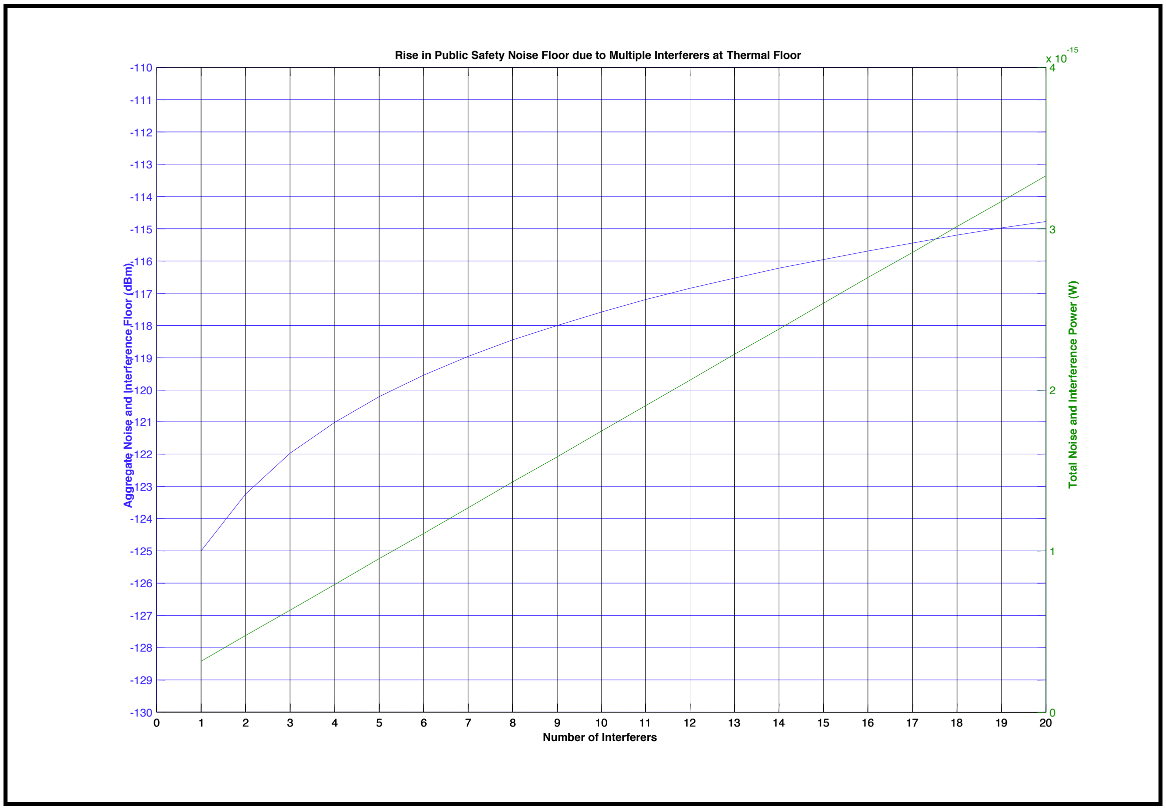


Figure K-2: Rise in Public Safety Noise Floor due to Multiple CMRS Interferers

Figure K-2 represents the rise in the noise and interference floor (corresponding to a loss in sensitivity) versus the number of Commercial Mobile Radio Service (CMRS[2]) interferers. Each interferer is assumed to be at the same level (in-band) as the public safety thermal noise floor ($k \cdot T \cdot B \cdot N_f$). In this case, the Public Safety thermal noise floor was set to -128 dBm (*ENBW* = 10 kHz, N_f = 6 dB), but the effect is clearly scalable to other values. It is also evident that multiple interferers dramatically reduce the sensitivity (hence coverage reliability) of Public Safety.

[2] A category under which ESMR services would fall.